THE FOREST INDUSTRY IN THE ECONOMY OF THE YUKON

by
Colin Heartwell

Canada

Yukon
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In order to obtain a more complete understanding of the opportunities and constraints to the development of Yukon's forest industry, the governments of Canada and Yukon signed a special agreement in October, 1986. The Yukon Departments of Renewable Resources and Economic Development: Mines and Small Business, Indian and Northern Affairs Canada and the Canadian Forestry Service agreed to finance an eighteen month series of studies on Yukon's forest industry. This work was also supported by the Yukon Forest Industry Association.

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Abstract

A study of the Yukon's small but vital forest industry was undertaken in 1987. Each of the industrys' sectors, namely: logging, sawn lumber, houselogs, fuelwood, and pine seeds, were analysed. Analysis included a variety of socio-economic indicators that described the forest production facilities, their physical and financial capabilities, and the structure of the industry. Forest resources, employment, income, production and capacity, socio–economic impact, and annual revenues and expenditures are assessed in the report.

The major impediments and economic benefits of development of the forest resource are discussed and suggestions are made on methods for improving the Yukon Industry's financial position and viability for the future.

Résumé

L'industrie forestière du Yukon, modeste mais vitale, a fait l'objet d'une étude entreprise en 1987. On a analysé chacun des secteurs de cette industrie : abattage, production de bois de sciage, de rondins de construction, de bois de chauffage, de graines de pin. L'analyse a porté sur un certain nombre de données socio-économiques qui rendent compte des installations de production, de leurs moyens matériels et financiers et de la structure de l'industrie forestière. La rapport fait une évaluation des ressources forestières, de l'emploi, des revenus, de la production et des capacités de production, des incidences socio-économiques ainsi que des recettes et des dépenses annuelles.

La rapport trait de l'expansion de l'industrie forestière, des principaux obstacles qu'elle est appelée a rencontrer aussi bien que de ses avantages économiques. On y propose des méthodes visant à améliorer la situation financiere et les perspectives d'avenir de l'industrie forestière du Yukon.

Executive Summary

The forest industry in the Yukon is a small but vital part of the economic fabric of the territory. While the forests in the Yukon have played a particularly diverse and important role in the development of the territory, there is little available recent information on the industry. The purpose of this report is to provide the necessary background information required to assist decision makers in developing and enhancing the potential of the industry.

In this paper the industry is divided into four basic sectors, namely: logging, sawn lumber manufacturing, roundlog production, and fuelwood harvesting. As well, pine cone production is discussed wherever data are available. The paper analyses the industry in terms of a variety of socio-economic indicators that describe the forest production facilities, their physical and financial capabilities, and the structure of the forest industry. Forest resources, employment, income, production and capacity, socio-economic impact and annual revenues and expenditures are assessed in the report. The major impediments and economic benefits of development of the forest resource are discussed and suggestions are made on methods for improving the industry's financial position and viability in the future.

Section 2 of the study provides a review of Yukon's forest resources and a summary of the industry's history. The Yukon's forest resources are not extensive, with a potential volume of 456 MM m^3 of logs available and a possible Annual Allowable Cut (AAC) being conservatively set at 340 M m^3 per year. Economically accessible areas in northern B.C. could increase the total AAC to 770 M m^3 per year.

Yukon forests contain good quality, small diameter spruce and lodgepole pine that can provide a reasonable range of forest products. The Yukon forests can be used to produce higher quality and more consistent building construction products and a variety of higher value board and specialty lodgepole pine products than other competing regions. The small diameter of the trees, however, requires that Yukon firms maximize the quantity and value of products produced from each log in order to be profitable.

Yukon's forest industry is dependent upon the overall level of economic activity in the territory, and the history of forest industry development mirrors that of the territorial economy. The first sixty years of the forest industry is characterized by long periods of very modest activity followed by two short periods of frantic activity, the Klondike Gold Rush, and construction of the Alcan Highway.

Throughout this early period, commercial fuelwood production dominated the forest industry. Sawn lumber manufacturing was highly cyclical, roundlog production was a small but steady sector, and pine cone production did not exist. Local sawn lumber was being used in mining for timbers and outbuildings, while most of the building construction materials were imported from British Columbia.

During the 1960's and 70's, there was a significant investment in the sawn lumber manufacturing sector and several new mills began operation. Production rose dramatically and the installation of dry-kiln facilities allowed one Yukon firm to compete locally with imported wood products and to export lumber to Alaska and Western Canada. While sawn lumber was expanding, fuelwood production activity declined rapidly due to the loss of river steamers and to the importation of cheap fuel oil. Houselog activity remained a small, but steady business.

During the 80's there was another reversal in fortunes, with the economic recession devastating the sawn lumber manufacturing industry and high oil prices rapidly increasing the demand for cheaper fuelwood. Pine cone collection, which was modest in the late 70's, expanded rapidly into a viable part-time business for many Yukoners. Houselog production remained a small, yet stable forest sector.

In section 3, the basic characteristics of each of the sectors of the forest industry are analyzed (Table E–1). The industry consists of 82 firms scattered throughout the territory, with most firms having been in business for more than a decade. These businesses are small firms (<5 employees) that are predominately owned by long term Yukoners and are essentially seasonal in nature. Most firms and employees do not generate full-time income from these businesses. Rather, forestry activities allow Yukoners the opportunity to obtain supplemental winter income and thereby supplement other seasonal endeavors such as placer mining, agriculture, and fishing.

In June, 1987, the estimated total value of production in the forestry industry was just less than $4.0 million. Total employment in the industry was estimated to be 1440 person months (121 person years) and the value of wages and salaries was estimated at about $2.2 million in 1987. Average income per person year was estimated to be $18 700, slightly above the Yukon average. The total capital investment in the forest industry was $4.75 million.

In addition to the direct economic impacts, it was estimated that there were indirect economic effects, or spinoffs, that created an additional 931 person months of employment (77 person years), bringing the total employment effect to 2371 person months (198 person years).

Overall, the industry contributes about 1% of the total Gross Territorial Product, but provides an important source of employment, especially for rural Yukoners. As well, the income from these jobs tends to remain in the

TABLE E-1. Key forest industry characteristics for 1986/87

Forest section	No. of firms	Employment (PM)	Employment (PY)	Production quantity	Value ($ 000)	Total Wages and salaries ($ 000)	Average income per person year ($ 000)	Capital investment ($ 000)
Logging	14	161.0	13.4	38,754.00 m^3	574.63	283.26	21.12	1100.00
Sawmilling	17	146.1	12.2	6841.60 M fbm	1553.05	297.00	24.00	2902.00
< 100 M	8	22.2		310.00	93.30	57.20	24.00	728.00
100 M–1 MM	7	60.9		2454.00	461.72	150.00	24.00	716.50
> 1 MM	2	63.0		4077.60	998.03	55.00	24.00	702.00
Commercial fuelwood	25	753.0	62.8	68,170.00 m^3 28,371 cords	2257.78	1016.55	16.20	400.00
Misc. roundwood	6	42.0	3.5	4011.00 m^3	140.85	57.60	19.20	250.00
Pine cones for seed	7	72.3	6.3	2170.00 hl	173.60	43.94	7.32	100.00
Wood mfg.	13	272.0	22.7	na	na	522.24	23.04	na
Total	82	1446.4	120.9		3984.43	2202.59	18.70	4 752.00

Source: Forest industry survey, DIAND–YUKON (files and records)
See Appendix II for notes.

territory and the profits from the forestry firms accrues to Yukon residents.

Hyland Forest Products had just re-opened during the period of this study (late winter, 1986/87), after having been closed for renovation and mill upgrading, and the full impact of the firm had not been felt. If the full capacity of Hyland Forest Product's employment were added, there would be a further 480 person months of employment created directly at the mill and 120 person months of direct employment in logging. With a multiplier of 2.8 and 1.4 respectively this would bring the total employment impact in the forest industry to 1417.7 person months of additional employment or 126.5 person years.

The industry is concentrated in Whitehorse and Watson Lake, but there are forestry firms in every Yukon community. Forestry firms provide income, stability, and support for many smaller Yukon communities, especially in Watson Lake, where the Hyland Forest Products sawmill is the largest employer.

Forestry is also a major industry for native investment and employment. Every Indian band is involved in fuelwood production, while there are four Indian firms operating in the logging and sawn lumber manufacturing sectors and one collecting pine seed. While precise numbers on employment in the industry were not possible, it was estimated that about one third of all employees or 500 person months were Indian people.

Total forest production in 1986/87 was 140 851 m^3. The sawn lumber manufacturing sector was responsible for only 27.5% of the total, while the commercial fuelwood produced an estimated 48.4%, domestic fuelwood produced 21.4%, and the houselog sector produced only 2.3%. Total production varies considerably between market areas. Sawn lumber manufacturing dominates production in Dawson City, Mayo, Watson Lake, and Beaver Creek, while fuelwood is the major product in the remaining communities. Watson Lake is the territory's sawn lumber manufacturing center, while two-thirds of the fuelwood is produced in the Whitehorse region.

In addition to the basic industry characteristics, Section 3 points out several interesting items. First, forestry in the Yukon really has four significant sectors, but is dominated by fuelwood production rather than sawn lumber manufacturing or logging. Second, there is an immediate need to find new investors in the forest industry as a significant portion of the present owners are over the age of 55 and considering leaving the industry in the next few years. Third, the capital equipment base in the sawn lumber manufacturing sector is in generally poor condition and operating at less than 15% of its capacity. Efforts must be made to increase the capacity utilization and to encourage reinvestment in the industry.

Fourth, the present trend in the sawn lumber manufacturing sector across Canada has been towards a two-tiered production process, with a few large mills producing almost all of the low-value, high-volume dimensional lumber and numerous small mills producing the higher-value, lower-volume green timbers and specialty products. Yukon firms are in a similar situation and smaller mills should endeavor to concentrate on producing the higher-value specialty products and leave the larger mills like Hyland to concentrate on the dimensional lumber market.

Finally, the small sawmills in the Yukon are able to supply far more green timber and specialty products than the market can absorb, despite using less than 10% of their capacity. To increase capacity utilization, smaller Yukon firms must consider developing new products and new markets, including markets outside the territory. Hyland, on the other hand, has sufficient potential demand for dimensional lumber in the territory to meet its present production.

In Section 4, there is an analysis of the production costs and revenues in the forest industry. Clearly, the viability of the forest industry depends upon the ability of firms in each sector to produce their products at the lowest possible costs, and the ability of these same firms to be able to supply the necessary products to the consumer at the lowest possible cost.

Logging firms and integrated sawmill owners reported that logging costs in the Yukon averaged $16.99/$m^3$ of logs in 1986/87. The costs for falling, skidding, and loading were fairly similar amongst reporting operators, with the major differences being attributed to the distance to the wood supply and the ease of access to the prospective sites. Log hauling could add as much as $6.50/$m^3$ to logging costs while road construction pushed costs still higher.

Logging costs in the Yukon were very competitive with logging costs in other regions of Western Canada, and $8-10/$m^3$ cheaper than logging costs in the interior of B.C. The lower logging costs appear to be attributed to the closer proximity of the mill to the wood supply and much lower stumpage rates. Conversely, firms in other regions are able to reduce log costs by selling their wood wastes for hog fuel or pulp chips, while Yukon firms usually receive no income from the waste and often must incur additional costs for disposal.

Sawn lumber manufacturers faced average costs for producing lumber products of $140.69/M fbm during the 1986/87 season. The median costs were $146/M fbm and overall costs ranged from $116/M fbm-170/M fbm. Rough timbers, houselogs, and larger rough dimensional products could be produced for costs near the low end of the range, while standard dimensional products and specialty items were at the high end of the range. Planing of lumber was estimated to cost about $35/M fbm.

While logging costs in the Yukon are competitive

with other regions, sawn lumber manufacturing costs were significantly higher than other areas. The report showed that the northern B.C. firms could produce kiln-dried dimensional lumber, excluding tax, at the mill gate for an average of $197.46/M fbm while Yukon firms produced the material for $245.08/M fbm, and the NWT produced the material for $230.42/M fbm.

The ability of Yukon firms to compete in the local market has been due to the natural tariff barrier of transportation that adds a $65-80/M fbm cost to products like rough green timbers and siding that have low demand, are more costly to transport, and are not geared to be efficiently processed in large interior B.C. mills. The results also showed Yukon sawmills also tend to produce larger quantities of green and rough lumber because they can profitably sell their products, while they are not competitive in producing and selling standard dry dimensional lumber products.

The competitive risk is high for small Yukon firms to sell standard dimensional products and there is little financial incentive to do so in the local market. Smaller firms were encouraged to increase capacity utilization through the increased production of specialty items (siding, interior finishing). Smaller firms should also consider getting more heavily involved in retail lumber and hardware sales as a means of improving profitability.

Government financial and technical assistance will be required for these smaller firms to convert to newer technology needed to produce these products and to find and penetrate new markets. Hyland Forest Products on the other hand underwent a major refurbishing and should be able to reduce its production costs to a level competitive with southern producers. Hyland is likely to be the only firm to compete favorably in the dimensional lumber market in the Yukon.

The fuelwood sector, like the logging sector, appears to be a reasonably profitable and highly competitive business. Production costs for a standard fuelwood operation were estimated to be $45.88/cord, while revenue from that cord would be about $75.00. This brings a fuelwood operator a gross return of about $29.12/cord or a 38.8% markup. This markup is consistent with small commercial manufacturing concerns and should allow firms to maintain a reasonable profit. Yukon fuelwood firms appear to be more competitive than NWT producers, being able to produce fuelwood for $15/cord less.

Pine seed producers are able to collect cones for an estimated $28.18/hectolitre, while selling their products for about $75/hectolitre. This brings a handsome gross return of $47/hectolitre for the producer, however, the smaller production volumes mean that overall profits are not high. Unlike the other sectors, the pine cone collection is controlled by three cone buyers who have the cones picked on contract.

In addition to analyzing actual production costs, Section 4 deals with determining if the logging and sawn lumber sectors are producing their products at the lowest possible cost or the most efficient level.

While there are several factors including forest stand size, access to the stand, and distance of the resource from the mill that make it difficult to assess logging operations, the study shows that logging firms can reduce their costs from $1.50-3.00/m^3 if they maintain consistent skidding volumes of 75 m^3/day over a 40-day season. As well, if firms take advantage of the Yukon's Roads to Resources programs, it is possible to reduce road access costs by 50 to 100%. Finally, logging firms can reduce their logging costs if they implement maintenance record systems and preventative maintenance plans.

Logging firms, with the possible exception of those who are considering logging for Hyland Forest Products, have not been encouraged to move to automated equipment. The use of automated logging equipment is better suited to high volume harvesting for large scale production facilities than for small Yukon mills. As well, the high capital costs, reduced flexibility and low utilization levels of automated equipment tend to indicate that it would be unprofitable to move to a more mechanized logging process.

Recent research in B.C. also tends to point to little opportunity for logging firms to reduce costs by selling wood residue. A study by Nagle *et al* (1987) indicated that wood residue chippers located at the logging site faced production costs of $25/m^3, while those located at the mill site faced production costs of $10-12/m^3. Nagle suggested that under the present and expected future fuel costs, wood residue production costs in the bush would be prohibitive.

For sawmills, the visits to mill sites indicated that there were many areas where cost improvements could be made to enhance the efficiency of mills. Using a model developed by Beaumont (1978), it was found that an efficiently-sized logging/sawmill that produced 12 000 fbm/day over a 70-day season should have total production costs, including log costs, of $135-140/M fbm for rough lumber, and $165-180/M fbm for green planed lumber. These costs were at least $55/M fbm less than the average Yukon mill could produce a similar product in 1986/87.

The reasons for the higher production cost in the Yukon mills is due to the limited use of the existing equipment, the use of less productive equipment, and equipment-maintenance problems. Yukon mills operate at less than 15% of their operating capacity, far below that of other regions. Efforts must be made to increase this utilization level. Most Yukon firms use basic circular headsaws for both primary and secondary breakdown of their logs. Circular headsaws are reasonably efficient for use in primary breakdown but they are highly inefficient

at turning basic cants into standard dimensional lumber. Equipment breakdowns and associated downtime were considered a significant problem among several operators and could increase production costs by up to $6.00/M fbm.

In order to reduce operating costs it is suggested that efforts be made to increase equipment utilization, to make a special effort to repair and refurbish existing facilities, and replace any defective equipment, and develop improved maintenance programs. Peschke (1986) has also listed several ways to assist operators to reduce operating costs.

Yukon sawmill firms have used basic circular saw equipment in the production of sawn lumber for decades. This milling equipment has been the standard of operations in the Yukon, and for the smaller operator, will likely remain the main element in the sawn-lumber production process. Contrary to popular opinion, the smaller mills (<1 MM fbm/yr) can be technically efficient, and several authors have shown that it is the very small and the very large firms (>20 MM fbm/yr) that will survive the present technological revolution in production technology. Intermediately-sized firms will be eliminated as they face higher capital equipment costs without attendant reductions in labor costs.

The success of the small operator lies in the use of the integrated operation, with the owner being involved in logging the wood, sawing it into products, and selling directly to the customer. The owner/operator controls the production processes from start to finish, choosing the appropriate trees, hauling them to the yard, inspecting each log closely to determine the proper cuts, producing from each log the maximum volume obtainable with his/her equipment, and selling directly to the consumer. The process reduces waste, improves the quantity and variety of products recovered, and if done properly, will result in profits equal to or better than larger operations.

There are some specific modifications in existing equipment using newer technology that would assist firms to increase productivity and quality, while reducing costs. The addition of new equipment that combines circular saws with edgers and gang resaws would allow Yukon operators to take advantage of the inherent advantages of their existing circular saws.

Yukon firms should attempt to improve their lumber recovery by moving to circular sawblades with narrower kerfs. Installing new, thinner kerf saws on existing circular saws can be done for about $2,000. Another important improvement would be for operators to implement quality control methods and possibly purchase new setworks in order to control target size and cutting efficiency. The capital costs of these investments should be recovered in one or two years through increased lumber output from each log and better quality of output.

Yukon firms tend to have stationary sawmills rather than portable mills and there is good evidence to suggest that Yukon firms should consider attempting to move to a concept of more portable milling operations. Since 40% of each log is presently being turned into wood residue for which there are limited markets, it means that $7/m^3 is being spent by the average mill owner to move waste material from the woods to the mill. The new portable mills cost from $13 000-$45 000 and less expensive used equipment is available. However, markets for wood residues from sawmills is beginning to open up with the construction of Klondike Central Heating and further opportunities exist for selling residue to the new Yukon College. The smaller operator has a good potential to be competitive in the sale of wood residue to these markets, and operators should investigate this potential carefully.

In Section 5, market development opportunities are summarized from recent market research done by Heartwell (1987). The results indicate that the major markets for Yukon forestry firms exist in the Yukon. Fuelwood operators also have the potential of expanding sales to industrial heating markets within Yukon. Sawn lumber manufacturers have local demand for almost 15 MM fbm of SPF products, with the largest component being kiln-dried dimensional lumber for building construction. Houselog firms maintain a clientele that usually allows them to remain busy during all phases of the business cycle.

Export markets are available to all sectors. Fuelwood sales to the Alaska Panhandle and Seattle are possible, as are log exports, either raw or as log home kits. The potential for sawn lumber product exports is also excellent with the Mackenzie Delta and Alaska being the primary longer term-targets for dimensional lumber development. Markets in the United Kingdom and the Pacific Rim nations also have potential for dimensional lumber exports. Specialty products have good export potential in Alaska, the United Kingdom, and Europe, while pine seed markets in northern Europe are opening up. The market for log home kits is quite large but there are significant impediments to Yukon firms accessing these markets.

Section 6 outlines the various impediments to future development of the forest industry in Yukon that were found during the research. The consensus from the interviews with forestry firms was that the industry faced several real constraints to development, namely: the general structure of the economy, timber supply, technical and financial assistance, forest regulation, and the apparent monopoly of Hyland Forest Products.

The volatility of the business cycle in the Yukon dramatically increases the risk of failure in a business such as forestry where the demand for forest products is directly dependent upon the amount of economic activity. The lack of information on timber supply in the Yukon, the lack of a secure timber supply through tenure arrange-

ments, and land use conflicts arising from land claims and new legislation make it more difficult for firms to obtain the necessary financing to expand production or to improve their equipment.

Yukon forestry firms do not have access to ongoing technical advice and assistance from knowledgeable foresters, like that provided to agricultural concerns. Without that technical assistance, forestry firms are not as likely to take advantage of existing methods to improve the efficiency and effectiveness of the industry.

Yukon forestry firms face a higher risk than other sectors of Yukon's economy and, therefore, need access to financial assistance to allow the industry to grow and develop. For the most part, the Yukon government has put in place the types of financial assistance programs that are required to meet the needs of the forest industry. Forestry firms must actively work to access the funds from these programs and the government should ensure that the regulatory framework for delivering the programs is effective.

The absence of a clear forest policy was considered a serious impediment since it prevented any clear impressions of the priority that the industry would receive for the Yukon's limited forest resources. The operators felt that a firm policy was required in order to remove the uncertainty surrounding the industry, and to provide firms with a consistent regulatory framework which would allow them to develop long range plans for the best utilization of their capital and equipment.

Forestry operators also requested that the government review its purchasing policies to see if there were possibilities for modifying the rules to allow greater use of locally produced green or air-dried products, rather than imported kiln-dried products. As well, they requested that government make a better effort to send its purchasing agents to rural communities in order to see the types of good and services these local forestry firms could provide.

Finally, forestry firms were concerned about the potential for Hyland Forest Products, a Yukon crown corporation, to operate an apparent monopoly in the territory and cause smaller firms to be driven from business. Hyland appears to be in the unique situation of being a Crown forest corporation responsible for producing 85% or more of the region's sawn lumber output. In order to ensure that the market control held by Hyland does not become unfair competition, it was suggested that consideration be given to regulating the firm in a manner similar to that for other monopolies like Yukon Hydro or NorthwesTel.

In the concluding section, a few suggestions are expressed that could improve the potential of the industry to grow and develop. The four major suggestions are:

1. develop forest industry resources information;
2. secure technical advice and assistance to all sectors of the forest industry;
3. develop a formal forest policy and a forest management regime; and
4. provide research and development funding into various aspects of the forest industry.

Both the Yukon and federal governments are offered several alternatives for funding and administering these programs with suggestions ranging from the development of a multi–year Canada/Yukon Forest Industry Agreement to negotiating agreements to allow existing agencies such as FORINTEK and FERIC to conduct the work.

As well, it is suggested that increased training be provided to forestry firms through development of forestry-specific training courses at Yukon College, and that improved marketing support be provided to allow firms greater access to the local, regional, and world forest products markets. Finally, increased financial assistance to the existing forest industry association is suggested as a possible method for the industry to assist itself to develop the forest industry.

1.0 INTRODUCTION

The forest industry in Yukon is a small but vital part of the economic fabric of the territory. Moreover, the importance of the forest resource to the welfare of Yukon's residents cannot be defined in monetary terms alone. The forest resource provides not only jobs and income during the harvesting of the trees, but also intrinsic and invaluable aesthetic views to tourists and residents, and is part of the cultural heritage of this northern society.

Historically, the forest has played a particularly diverse and important role in the development of the Yukon from fuelwood to heat homes, to mining timbers to allow the wealth of the territory to be developed and utilized, to unspoiled wilderness that attracts hundreds of thousands of tourists annually. In the future this role can continue to evolve as greater use is made of the entire forest resource.

In order to assist in meeting this potential and ensure sound forest management decisions, the government has identified a need for more information on the history, structure, production attributes, economic impact, and resource development opportunities of Yukon's forest industry. The purpose of this report is to attempt to provide this background information and place the Yukon forest industry in its proper context.

The information reported here is expected to be used to help government departments and agencies formulate policies and programs to assist in developing the forestry sector, to enhance the analytical capability of economic research groups, and to provide information to the forestry community and general public.

More specifically the objectives of the paper are:

1. to provide a concise history of Yukon's forest industry;

2. to describe forest production facilities, their capabilities, and the structure of the present industry;

3. to assess the financial capability of the Yukon forest industry;

4. to determine the major impediments and economic benefits of development of the forest resource; and

5. to provide suggestions on methods for improving industry profitability and viability in the future.

This report is divided into seven sections. This first section provides the general introduction to the study, including the purpose, objectives, and study methodology. The second section provides a concise look at the history of the forest industry, with emphasis on developments in the past fifteen years. It indicates that the forest industry consists of a broadly based group of firms engaged in fuelwood production, sawn lumber production, roundwood production, and pine cone production. The industry retains largely the same structure as it did at the turn of the century, with fuelwood activities dominating.

The third section provides a detailed discussion of the various production attributes of Yukon's present forest operators. The Yukon's forest industry appears to be competitive in most sectors, is dominated by long-term Yukoners operating small family run firms and supplying a variety of products to the local markets. The industry is labour intensive and uses equipment that is often decades old.

This section also outlines the significant socio–economic impacts of the Yukon's forest industry, especially in smaller rural communities, and the impacts that Hyland Forest Products will have on the industry. Certain comparisons are made with other regions in Western Canada in order to place Yukon's firms in proper perspective.

The fourth section provides information on the production costs and revenues accruing in each sector of the forest industry. This information confirms the existence of strong fuelwood and houselog sectors, but underlines the inherent weaknesses in the sawn lumber sector. The fifth section summarizes the market opportunities available to the forest industry, most importantly for specialty product sales and exports of high quality logs and dimensional lumber products.

The sixth section outlines the impediments that Yukon forest operators felt hindered development. The economic structure of the territory, timber supply, lumber recovery, royalty systems, tenure, and financial and technical assistance to the industry are discussed along with several other impediments. Providing sufficient timber, designing adequate tenure systems, and providing technical advice are considered the highest priorities by the industry.

Finally, the seventh section outlines a number of recommendations for improving the efficiency of the industry and suggestions on support that government can provide to assist the industry to meet its potential.

1.1 Study Methodology

The Yukon's forest industry has consistently gone unnoticed by historians, analysts, and statisticians as public attention has focussed on more glamorous industries in the territory, such as mining or fur farming. The preliminary research undertaken for this study found only limited data on the industry and a great deal of primary research was undertaken. Library research, interviews, reviewing the files and records of the forestry offices of the Department of Indian Affairs and Northern Development in Whitehorse, and an extensive survey of forest operators in the territory (July–October, 1987) were the major elements used to collect the data. The specific methodology for conducting the survey and copies of the questionnaire

used are provided in Appendix I.[1]

To assist readers, the information in this report was summarized by each of the four major forest industry sectors in the Yukon. The report concentrates on the primary wood using industries that consist of all the firms using roundwood in their manufacturing processes or engaging in logging activities, including: logging, sawmilling–planing, houselog production (log home builders), and commercial fuelwood. As well, the contribution of the pine seed sector is included wherever data permitted.

Millwork, furniture construction, and other processing activities are normally part of the manufacturing component of the forest industry, but are not discussed in this report. Other recent studies (HLA 1987; Deneki 1986), describing these sectors in detail, are available for review from the Yukon Department of Economic Development.

2.0 FORESTRY IN THE YUKON - A PERSPECTIVE

This section provides a concise look at the history of the forest industry, with emphasis on developments in the past fifteen years.

2.1 Yukon forest resources

The Yukon covers an area of 48.2 million hectares, of which less than 7.3 million hectares are defined as productive forest lands[2]. The Canadian Forestry Service estimates that this land base is able to produce a total volume of 456 MM m^3 of logs, with an Annual Allowable Cut (AAC) estimated to be 340 M m^3 annually. Economically accessible regions in northern B.C. provide an additional annual volume of 431.3 M m^3 that can potentially be accessed by Yukon firms. This brings the total possible harvest to more than 770 M m^3 annually.

White spruce (*Picea glauca* (Moench) Voss) and lodgepole pine (*Pinus contorta* Dougl.) are the predominant commercial species, representing over 95% of the total production. Lodgepole pine makes lower quality dimensional lumber due to the numerous knots and other defects but produces a superior range of finishing materials. Spruce exhibits the reverse tendency. Hence efforts should be made to separate the products and to produce and market those products that each species can deliver most effectively. The broad variety of potential uses for each species are outlined in Table 1.

Yukon's forests provide smaller diameter logs that require more effort per unit to harvest, create more wood residue, have a lower lumber recovery, and provide a narrower range of products than is the case in adjacent B.C. and Alaska coastal forests. However, Yukon forests appear to produce a higher quality and more consistent product for use in building construction and pulp and paper production. Moreover, several studies indicate that higher value board and specialty products can also be produced if care is taken in the milling process to maximize product quality rather than quantity.

Yukon firms must ensure that their production processes are geared to producing these smaller logs and that every effort is made to maximize the quality and value of the products that come from each log (Rowe 1972; Oswald and Senyk 1977; Bickerstaff and Honer 1985; and Heartwell 1987).

2.2 Historical development

The Yukon forest industry is dependent upon the overall level of economic activity in the Yukon and forest production closely follows the ebb and flow of the economy. Figure 1 outlines the production in each of the sectors since the turn of the century[3].

Forest production was frantic at the turn of the century, averaging over 200 M m^3 in 1899, but by 1910 it had plummeted to less than 22 M m^3. Production remained at very modest levels over the next two decades mirroring general economic activity. The opening of the United Keno Hill mine and other mining activity in the late 30's fostered some growth, but it was not until the construction of the Alaska Highway in the early 40's that production soared, reaching 251 M m^3 in 1943.

Production declined dramatically again as the highway construction came to an end, but increased mining, tourism, and government activity after the war lead to a reasonably steady production, averaging around 50 M m^3 annually until near the end of the sixties. Production grew more rapidly in the seventies, following the strong expansion in the economy and major housing shortages throughout the territory. Finally, the eighties brought dramatic declines in production during the 1980–85 recession, followed by a fairly strong recovery in 1986 and 1987.

The history of Yukon's forest industry can be divided into three distinct segments: the early years from 1899-1959, the modern era from 1960-1979, and the eighties. The forest industry of the early years was a very modest industry that was punctuated by the two small periods of frantic activity. The sixties and seventies brought the modern era of steady economic growth and increasing expansion of the forest industry. Finally, the economic recession of the early 80's dealt a serious blow to the sawn lumber sector of the industry while creating opportunities for other segments of the industry.

2.2.1 The early years

Prior to the turn of this century, the Yukon's population consisted largely of natives, explorers, and a few fur

TABLE 1. Potential uses of native Yukon tree species

Use	Species						
	Birch	Aspen	poplar	Balsam fir	Alpine Larch	Lodgepole pine	White spruce
Building material							
House logs					x	x	x
Const. lumber					x	x	x
Siding					x	x	x
Waferboard	x	x	x	x	x		
Particleboard	x	x	x	x	x	x	x
Finishing materials							
Boards	x	x		x	x	x	x
Paneling	x	x	x	x	x	x	x
Flooring	x				x	x	
Molding	x	x				x	
Veneer	x	x	x	x	x	x	x
Cabinets	x	x			x	x	x
Furniture components	x	x					
Pulp and paper							
Chips	x	x	x	x	x	x	x
Kraft pulp	x	x	x	x	x	x	x
Thermomechanical pulp	x	x	x	x			x
Newsprint	x	x	x	x		x	x
Agriculture							
Posts					x	x	x
Bedding	x	x	x	x			
Feed		x					
Energy							
Firewood	x	x	x	x	x	x	x
Hog fuel*	x	x	x	x	x	x	x
Pressed–wood logs					x	x	x
Miscellaneous							
Transmission poles					x	x	
Railroad ties					x	x	x
Export cants	x	x			x	x	x
Caskets	x						
Novelties	x						
Speciality items	x	x	x				
Christmas trees				x		x	x
Birch syrup	x						
Perfume/oils	x					x	x

* Hog fuel is sawmill waste not otherwise used: slabs, edgings, trimmings, defective boards, and miscuts that are chipped into small roughly-sized pieces.

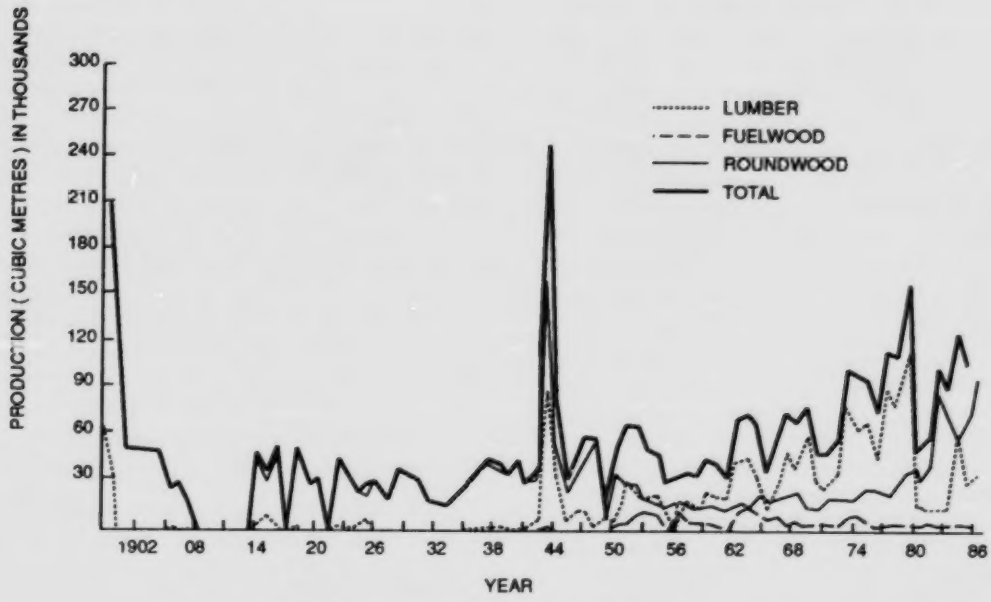

Figure 1. Yukon forest harvest 1899–1986

traders whose only use of the forest resource was for the occasional load of firewood and selected round logs for building construction.

With the onset of the Klondike gold rush in 1898, a forest industry developed in the Yukon in response to the demands created by mining development in the territory. Initially, several small primitive sawmills sprang up along the water route from Lake Bennett to Dawson City. These rudimentary systems provided whip-sawn lumber for boats, tent floors, and the first buildings during the population migration to Dawson City.

As centres became established, larger sawmills developed in several communities along the Yukon River in response to the strong demand for wood for home heating, sawn lumber for house construction, and for items such as flumes and sluice boxes used in mining activities. In Dawson City, in 1898, there was a tremendous demand for sawn lumber and twelve sawmills were reported to have produced about 12 MM fbm to support construction in the city[4]. The arrival of the White Pass and Yukon Route Railway in 1899 and the subsequent development of a river steamer system also created a large demand for fuelwood to power the engines. In addition, fuelwood was burned to thaw the permanently frozen ground in advance of the gold dredges and on individual mining claims[5].

The rapid population exodus after 1901 lead to dramatic declines in the demand for every form of forest product, and forestry activity fell precipitously. By 1914/15 officials reported that there were only three sawmills operating in the Yukon[6]. These three mills, two in Mayo and one in Dawson City, had a production capacity of about 1 MM fbm per year but production averaged only 100 M to 150 M fbm annually until the opening of the United Keno Hill mine (Figure 1). Fuelwood production continued to remain a strong and stable component of the forest industry during these years, with the river steamers consuming 8-10 M cords of wood each year, at a reported cost of $46 000, and the remaining fuelwood being consumed by home owners or placer miners[7].

By the early 1930's much of the supply of timber suitable for sawn lumber near the Yukon River was exhausted and most demand for lumber was satisfied from lumber imported from B.C. Native lumber was used for the construction of some homes, small boats, and scows, but all steamboats and barges operating in the Yukon were built with imported lumber. The demand for domestic forest products was heavily concentrated on fuelwood to meet the demand by the river steamers and the railway.

The Second World War brought a new demand for forest products with the construction of the Alaska Highway and Canol Road. The construction workers consumed large quantities of fuelwood for heat, while the road construction created a tremendous demand for sawn lumber products. Sawn lumber was used mainly for temporary construction facilities, bridges, and homes. Two mills were constructed on the Canol road and several new mills were established along the Alaska highway. By

the mid–forties there were an estimated ten sawmills operating in the territory.

Immediately after World War II there was a lull in production, but the opening of permanent hard rock mines in communities such as Elsa, Faro, and Whitehorse brought about resumed growth in the forest industry to meet the demand by mining companies for timber, mainly stulls, lagging, and ties. The continuing operations of White Pass and Yukon Route Railway also provided a steady demand for railway ties, bridge timbers, and various sawn lumber products for building construction.

The demise of the river steamers in 1956, however, lead to a significant decline in the demand for fuelwood. Each steamer that plied the Yukon River consumed 100-150 cords of wood for each 913 mile round trip and over the 56-year period, it has been estimated that more than 300 M cords of fuelwood were consumed[8].

Most dimensional sawn lumber for house construction continued to be imported from British Columbia after the war, despite dramatically increased productive capacity created by the highway construction. The forestry officials of the time indicated that local firms needed technical assistance to improve the quality of their products and none of the mills were grading their sawn lumber. In fact, one forestry official in Yukon was prompted to comment that "there is no seasoning or grading of lumber in the territory...and the forest service is attempting to provide technical assistance to the operators"[9].

Houselog production during this early period was small and dedicated to construction of log homes by residents or trappers. Pine seed production did not exist except for the occasional arts or crafts activity.

Employment in the early years was relatively small but did provide an important element in the economy. Table 2 shows employment levels in the forest sector from 1941–1981. In the forties, there were about 40 seasonal jobs in the forest industry, with the total rising during the war and declining thereafter to only 15 people in 1951. Increasing economic activity in the late fifties lead to increased employment and by 1961 employment in the industry had expanded to 71 jobs.

In summary, the first sixty years of Yukon's forest industry was characterized by long periods of very small scale activity followed by two short periods of intensive activity. Throughout the period, commercial fuelwood production was the dominant activity, with most of the sawn lumber being used as mining timbers and in the construction of smaller buildings. Sawn lumber production was subjected to significant cyclical fluctuations and the operators were usually producing with significant excess capacity. As early as the mid–1930's Yukon consumers became accustomed to obtaining their dimensional lumber supplies for building construction from British Columbia sawmills. Houselog production continued as a small but stable component of the forest industry, producing natural log homes and cabins for a select number of Yukoners.

2.2.2 The modern era

In the early years, the Yukon's forest industry was controlled by long–term Yukon business entrepreneurs who operated small businesses with less than five employees. However, in the late 60's rapidly expanding production in British Columbia and a trend to modern technology led a few southern companies to begin to invest in the territory. Yukon's economy was making a steady recovery as the new Cyprus Anvil mine was being developed to supplement mining activity in the Mayo and Whitehorse regions and increasing government involvement was stimulating economic activity. By 1967 there were ten sawmills operating in the Yukon with a combined capacity of around 7 MM fbm per year.

One of the southern firms to enter the Yukon was Acorn Timber Limited who obtained timber rights in the MacMillan Pelly region in the mid-60's and opened a mill outside of Whitehorse. The company invested more than $2 000 000 (1968$) in a sawmill/planer mill facility and produced a variety of sawn lumber products. In the early 70's the firm went bankrupt after failing to obtain timber rights in the Whitehorse area and being unable to compete with southern lumber. During this late-60's period, however, Acorn Timber was the North's largest producer and was seen as the beginning of new forest operations in the region.

In 1969 another firm, Atlin Industries Ltd. (later known as Brameda Resources Limited) made application to build a multi-million dollar wood processing facility in the Carcross area. The company planned to establish a facility that would produce both dimensional lumber and pulp chips, with annual production levels set at about 20 MM fbm. The company proposed to use the latest technology for small log processing to allow for the maximum recovery of forest products. The lumber was expected to be sold in the domestic market and the pulp chips exported to southern B.C. for input into their pulp and paper operations.

The firm was able to obtain cutting rights in B.C., but regulatory problems with the federal government in the Yukon and the lack of an assured timber supply, because there was no forest inventory, prevented the firm from obtaining the necessary timber base in the Yukon to allow the project to proceed. The early 70's recession also contributed to a decision to withdraw from development in the Yukon.

The economic recession of the early 70's also created financial problems for two Watson Lake firms. Originally established in the fifties, Watson Lake Lumber and B.C.-Yukon Forest Products Limited were purchased

TABLE 2. Employment in Yukon's forest industry, 1941–1981.

Industry Sector	1941		1951		1961		1971		1981	
	M	F	M	F	M	F	M	F	M	F
Forestry and logging	38	0	1	0	41	0	75	0	60	15
Lumber manufacturing	2	0	10	0	27	2	30	5	90	0
Other wood industries	0	0	4	0	2	0				
Total	40	0	15	0	70	2	105	5	150	15

Source: Census Canada – Various years

by Catermole Timber Ltd. of Vancouver in 1972. Watson Lake Lumber and B.C.-Yukon Forest Products Ltd. were medium-sized sawmill operations, each capable of producing about 10 MM fbm annually. Neither firm produced to capacity but were generally able to meet the government timber requirements to produce about 3 MM fbm annually in sawn lumber products. The two firms were combined by Catermole Timber Ltd. and rebuilt into a larger entity known as Yukon Forest Products, with a one-shift capacity of 20 MM fbm annually.

The opening of this operation doubled Yukon's lumber output during the 1970's and injected significant economic life into the Watson Lake community. Capital investment that had totalled about $190 000 prior to the seventies, climbed to $580 000 in 1973, less than a year after the opening of Yukon Forest Products. Over the next decade, there would be investments of more than $7 million in the Watson Lake facility, despite continuing operating losses[10].

Bob Catermole reported in an interview in 1980 that "the Watson Lake operation has not made the parent company a cent in profit, despite huge capital expenditures". He reported annual losses had averaged a quarter of a million dollars through the seventies[11].

Throughout the modern era, the small sawmill component continued to thrive, with the number of firms expanding to about 20 throughout the territory. Of this total, about 15 mills were actively producing products on any given year. These small operators continued to maintain reasonable production levels by supplying rough lumber and timbers to the booming mining industry and by selling green sawn lumber to local consumers involved in minor building construction and/or renovations. While most firms continued to operate with significant excess capacity, the demand created by annual exploration expenditures of over $20 million and three major operating mines provided a steady, reliable market segment for their green lumber products.

Figures 1 and 2 illustrate the growth of the sawn lumber sector during the modern era[12]. Sawn lumber production showed a definite cyclical demand pattern, but there was steady growth throughout the sixties. In the seventies, largely as a result of the Yukon Forest Products mill, sawn lumber production grew dramatically, dominating industry activity. During this period, sawn lumber overtook fuelwood as the dominant force and the industry began to make its first inroads into the home construction markets selling standard dimensional lumber.

The dramatic growth in sawn lumber was almost exclusively due to the expansion of the Yukon Forest Products operation, with the firm producing well over 85% of the total sawn lumber in the territory during these years. British Columbia firms still supplied two thirds of the standard dimensional lumber market, but Yukon Forest Products was steadily expanding their market share. Yukon sales were 3-5 MM fbm per year, with the remaining production being exported to Alaska and Alberta[13].

Figure 2 also demonstrates clearly that the fuelwood production sector was much weaker most of this period than it had been previously, averaging less than 18 M m^3 (10 M cords) per year. The loss of the river steamers and conversion of the railway engines from steam to diesel, combined with cheap oil prices and declining electricity costs, lead to major declines in the demand for fuelwood products throughout most of the period.

In the late-70's the fuelwood sector began to recover as the Arab oil embargo, and rapidly rising oil prices, lead to an increasing consumer demand for the cheaper alternative fuelwood. Figure 2 shows fuelwood production rising to around 28.9 M m^3 by the end of the decade, an annual increase averaging 8.0%.

Houselog production remained modest and fairly stable at around 6 M m^3 annually during this period. Demand has risen over the years but continued to respond

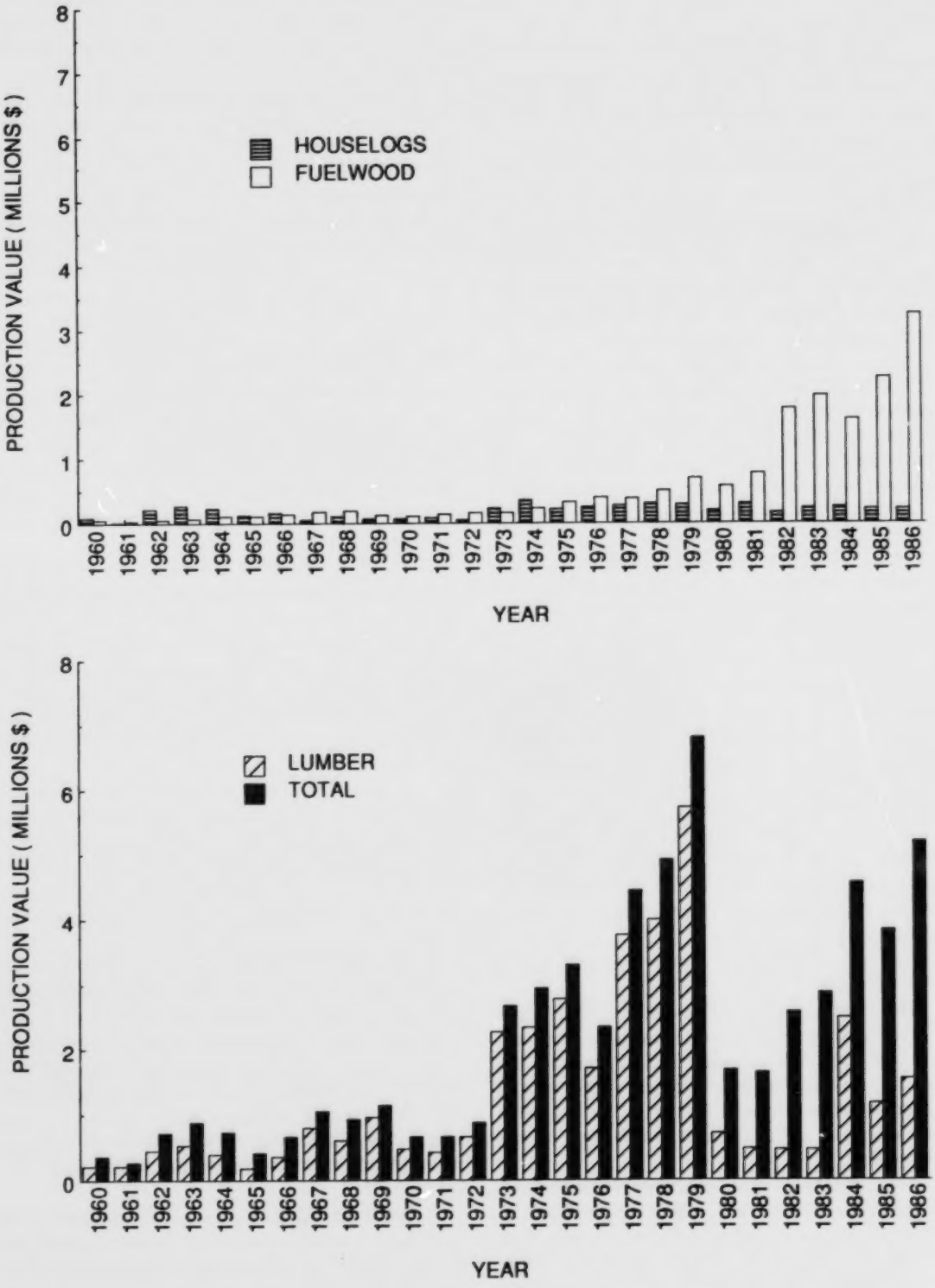

Figure 2. Value of forest production, Yukon 1960–1986

to a small market segment interested in constructing natural log homes.

The pine seed production sector was established during the late 70's as Swedish firms began to recognize the superior quality of Yukon lodgepole pine seed in meeting their requirements for improved planting stock for reforestation.

Employment and the value of production also grew strongly in the modern era. Table 2 indicates that employment grew from 71 to 120 people by 1971 and to 165 people by 1981. The majority of the additional employees were working at the Yukon Forest Products mill in Watson Lake but activity was spread throughout the territory. The value of production rose from $366 000 in 1960 to more than $6.8 million by the end of 1979.

Sawn lumber production values went from $222 000 to $5.7 million during that period. Fuelwood production value went from a modest $49 000 to almost $700 000. Houselog value increases were more modest rising from $92 000 to $286 000, but growth was still quite significant. In real terms, total production rose from $495 000 (1971$)in 1960 to well over $1 million by the end of the sixties, and topped $3.5 million by 1979 (Table 3).

As well, the activity helped to stabilize and diversify a number of communities throughout the territory, particularly Watson Lake. In Watson Lake, Yukon Forest Products became the town's largest employer.

In summary, the modern era was characterized by significant new investment by non-Yukoners in the forest industry and continued strong growth in most sectors of the industry. The majority of sawmills continued to produce green timbers for local use, but the Yukon Forest Products operation was beginning to provide strong competition to the British Columbia suppliers of kiln-dried dimensional sawn lumber products. Fuelwood production was low in the 60's but recovered in the late 70's as rapid oil price increases lead to a renewed demand for the cheaper fuelwood and a shift from oil to wood consumption.

2.2.3 The eighties

The rapid growth of the seventies ceased in the 1980's with a serious economic recession in the Territory. The failure of Foothills Pipeline Ltd. to construct the Alaska Highway Gas Pipeline, followed by the closure of two major mines, precipitated a major decline in general economic activity and a structural shift in the Yukon's economy.

As the level of construction activity plummeted and mining activity slowed in the early 80's, the production of sawn lumber fell from 115 M m^3 in 1979 to less than 19 M m^3 a year later (Figure 3). Modest production levels continued through 1981, 82 and 83, mirroring one of the territory's worst recessions. The value of production for sawn lumber fell accordingly from $5.7 million in 1979 to only $718 000 in 1980 and had fallen as low as $460 000 by 1982. In real terms the declines were even more dramatic.

The biggest decline in demand for sawn lumber was for dimensional lumber products for use in building construction. The recession also caused prices in southern Canada to fall and there was increased competition between B.C. and Yukon for a shrinking market. The demand for timbers and other rough lumber also declined during this period, but economic growth in the Mackenzie Delta region, caused by oil exploration in the Beaufort Sea and steady activity by small mining concerns, allowed many small firms to retain most of their markets.

The smaller sawmill operators continued in business, albeit at a lower level of production. However, Yukon Forest Products had spent millions of dollars in new plant improvements including a planer, kiln, and power plant and the dramatic decline in the firm's traditional markets was devastating. Financial losses climbed into the millions, and in 1983, with rapidly mounting debts, the firm was forced into receivership by its bankers, the Merchantile Bank of Canada.

In 1984, Catermole Timber Ltd. repurchased the company from the receivers and reopened the operation under the name Watson Lake Forest Products. The firm continued on a sporadic basis during 1985 but was not able to sustain viable operations. In July, 1986 the company was once again forced into bankruptcy by its new bankers, the Northlands Bank. In mid 1986, a contractor was hired by the receivers to saw the logs remaining in the yard and the mill was tendered for sale.

In view of the significant contribution of the mill to the community of Watson Lake, the Yukon Government decided in December 1986 to bid on the assets of the firm and was successful in purchasing the firm for $565 000. The new Crown corporation subsequently became a subsidiary of the government's Yukon Development Corporation.

Since the purchase, the government has spent millions of dollars to finance the log inventory, refurbish the sawmill, and provide working capital to get the project underway. New sawing equipment has been purchased or built, the planer facility completely rebuilt, and the steam plant and dry kilns were operational by the end of November, 1987. The mill manager indicated in May, 1987 that a total of $4.3 million had been committed for refurbishing, with additional funds for the log inventory and working capital[14].

While the eighties were extremely difficult for the sawn lumber sector, commercial fuelwood production increased rapidly and regained its dominance of the forest industry. Several energy conservation programs by the Yukon and federal governments, and a widening price ad-

TABLE 3. Value of forest production by sector (1960/61 – 86/87)

Year	Lumber		Value	Fuelwood		Value	Round wood	
	M fbm	m^3	($)	Cords	m^3	($)	Mlin.ft	m^3
1960	4038.0	20 589.1	222 065.0	6249.0	15 038.2	49 992.0	919.0	5211.0
1961	3822.0	19 682.6	210 183.0	4935.0	11 866.3	39 480.0	197.0	1104.5
1962	8092.0	42 716.2	445 295.0	5907.0	16 624.2	55 136.0	2103.0	11 923.0
1963	8999.0	46 360.8	539 942.0	5902.0	14 216.9	70 824.0	2723.0	15 434.7
1964	6558.0	33 786.5	393 462.0	8677.0	20 900.6	104 124.0	2309.0	13 084.1
1965	2654.0	13 650.5	185 783.0	6798.0	16 369.3	108 768.0	1198.0	6796.9
1966	5214.0	26 847.9	364 972.0	8411.0	20 249.2	134 576.0	1626.0	9204.2
1967	10 049.0	51 203.6	803 720.0	9399.0	22 628.2	187 980.0	612.0	3455.1
1968	7681.0	39 139.1	614 480.0	10 080.0	24 270.7	201 600.0	1151.0	6513.7
1969	12 058.0	61 455.7	964 640.0	6084.0	14 641.7	121 680.0	651.0	3681.7
1970	5459.0	30 926.1	491 310.0	5487.0	13 197.4	109 740.0	710.0	4927.8
1971	4713.0	26 706.3	424 170.0	7449.0	17 926.4	148 980.0	933.0	5126.0
1972	7394.0	37 694.7	665 460.0	7719.0	18 578.3	154 380.0	568.0	3228.5
1973	15 193.0	77 456.8	2 278 950.0	7964.0	19 173.0	159 280.0	1612.0	9119.2
1974	13 061.0	66 581.7	2 350 980.0	9644.0	23 222.9	231 456.0	1950.0	11 045.0
1975	12 345.0	69 923.5	2 777 625.0	11 475.0	25 970.0	315 562.5	420.0	2378.9
1976	8322.0	47 125.5	1 714 332.0	11 178.0	25 318.6	391 230.0	505.0	2860.4
1977	16 404.0	92 919.9	3 772 920.0	9626.0	21 806.9	385 040.0	535.0	3030.3
1978	14 131.0	80 034.0	3 999 073.0	12 776.0	28 943.6	511 040.0	745.0	4219.8
1979	20 440.0	115 633.0	5 723 200.0	17 432.0	39 478.9	697 280.0	715.0	4049.8
1980	3251.0	18 408.4	718 471.0	13 695.0	31 011.0	575 190.0	655.0	3710.0
1981	2511.3	14 225.0	487 192.2	18 215.8	41 249.6	765 064.6	957.4	5423.0
1982	2437.3	13 806.0	460 651.8	39 434.4	89 299.0	1 774 549.7	553.6	3136.0
1983	2359.6	13 366.0	471 926.7	32 741.8	74 143.6	1 964 508.8	793.0	4492.0
1984	11 331.7	64 188.0	2 487 092.4	26 942.9	61 012.0	1 619 268.2	809.4	4585.0
1985	5414.1	30 668.0	1 185 694.2	32 497.8	73 591.0	2 255 346.3	715.5	4053.0
1986	6841.6	38 754.0	1 553 050.3	43 314.8	98 086.0	3 248 608.3	708.1	4011.0

Source: Canada Department of Indian Affairs and Northern Development (DIAND) Forest Resources Division, Northern Affairs, Whitehorse–summary reports. Conversion rates are 1 cord=2.267 m^3 and 1 M fbm=5.662 m^3.
Prices were determined from correspondence in DIAND files over the years and represent the best estimate of the officials as to the prevailing values FOB Whitehorse.

TABLE 3. Continued

	Total	Pine Cones		Value	
	m^3	Kg	($)	($)	(1971 $)
1960	40 838.3	0.0	0.0	363 956.0	495 848.7
1961	32 653.6	0.0	0.0	269 335.0	359 113.3
1962	70 263.4	0.0	0.0	710 768.0	936 453.2
1963	76 012.5	0.0	0.0	883 112.0	1 143 927.5
1964	67 771.2	0.0	0.0	728 461.0	926 795.2
1965	36 816.8	0.0	0.0	414 324.0	514 688.2
1966	56 301.3	0.0	0.0	662 178.0	793 027.5
1967	77 286.9	0.0	0.0	1 052 900.0	1 217 224.4
1968	69 523.5	0.0	0.0	931 180.0	1 034 644.4
1969	79 779.1	0.0	0.0	1 151 420.0	1 223 613.2
1970	49 051.3	0.0	0.0	672 050.0	691 409.5
1971	49 759.3	0.0	0.0	666 450.0	666 450.0
1972	59 501.6	0.0	0.0	876 640.0	836 488.5
1973	105 749.1	0.0	0.0	2 680 030.0	2 378 021.3
1974	100 849.6	0.0	0.0	2 933 436.0	2 346 748.8
1975	98 272.4	0.0	0.0	3 303 187.5	2 384 972.9
1976	75 304.4	0.0	0.0	2 358 062.0	1 583 654.8
1977	117 757.0	57.0	20 726.9	4 446 186.9	2 537 750.1
1978	113 197.4	299.0	108 725.4	4 916 838.4	2 571 506.5
1979	159 161.7	261.0	94 907.4	6 801 387.4	3 229 502.8
1980	53 129.4	563.0	204 723.7	1 687 594.7	712 350.6
1981	60 897.5	279.0	101 452.8	1 651 974.6	629 319.7
1982	106 241.0	502.0	182 542.3	2 574 543.8	927 427.9
1983	92 001.6	519.0	188 724.0	2 863 235.5	988 331.6
1984	129 785.0	608.0	221 087.0	4 570 452.7	1 516 910.4
1095	108 312.0	525.0	190 905.8	3 846 755.3	1 235 308.5
1986	140 851.0	484.0	173 586.6	5 195 850.2	1 612 791.9

TABLE 4. Employment in the Yukon forest industry 1980–1986

Year	Forest Industry		Person months	Yukon total
	Full time	Total number		
1980	53	75	504	9 105
1981	27	58	235	10 574
1982	26	49	257	9 878
1983	19	43	124	8 907
1984	42	62	374	9 686
1985	47	67	324	9 527
1986	72	81	300	10 472

Source: Forest Resources Division – Northern Affairs (Yukon) – DIAND: Yukon Bureau of Statistics–Employment data Statistics Canada–1981 Census.

Note: Full time employment is reported from the Yukon Bureau of Statistics employment survey data from 1977–1986. The data only includes employment in logging and the sawn lumber manufacturing sector. The data on the total forest employment is derived from data supplied to Northern Affairs officials over the years and located in DIAND files.

vantage in favor of wood heat over alternatives, led consumers to shift away from oil-based fuels to wood-based fuels. This led to dramatic increases in the demand for fuelwood (Figure 3).

Total fuelwood production, including both domestic and commercial operators, increased from 31 M m3 in 1980 to more than 98 M m^3 in 1986. Commercial fuelwood production rose dramatically from 17 M m^3 in 1981 to over 68 M m^3 for 1986[15]. The commercial fuelwood operators were able to increase their market share from 42% in 1982 to over 69% in 1986. This was brought about by a trend from domestic to commercial production; a combination of consumers converting from oil to wood and an ability of commercial operators to convince households to purchase their wood commercially rather than harvesting it privately. The value of production also increased from $575 000 in 1980 to over $3.24 million in 1986. Houselog production continued its long-term stable trend throughout the eighties accounting for an average of slightly less than 10% of total fibre production (Figure 3). Production averaged 4200 m^3 annually, with the production value averaging about $220 000 per year. The 80's economic downturn had little effect upon the houselog market as there has been a relatively constant portion of the population demanding this type of product since the turn of the century.

Pine seed production that had started in the seventies began to increase rapidly in the eighties along with Swedish demand for Yukon's high quality lodgepole pine seed. Cone production for seed increased from 1268 hectolitres in 1981 to 2170 hectolitres in 1986. The value of production also rose from $101 000 to $191 000 in 1985, an average annual increase of more than 8%.

Employment plummeted through the eighties to less than 40 people in 1983 and remained low until recently with the reopening of the Yukon Government's Hyland Forest Products mill (Table 4). However, forest products manufacturing continued to provide supplemental income for a variety of firms engaged in complementary forest activities.

In summary, the eighties saw another reversal in the dominance of the forest industry, with the fuelwood sector reasserting its control over the market place and sawn lumber production declining significantly. The majority of the small operators continued in production at reduced levels during this period, but the dominant Yukon Forest Products mill went bankrupt. The bankruptcy brought home to many operators and observers the very negative effect that can occur for large sawmill operations when the economy suffers from recessions.

While the sawn lumber sector struggled, the fuelwood sector grew strongly in response to consumer support for lower cost wood heat and increased marketing efforts on the part of fuelwood producers. Pine seed production also grew by more than 8%/yr in the 80's in response to demand by Swedish buyers. Houselog production, on the other hand, captured 10% of the total industry output, but continued relatively stable throughout this period as it had since 1900.

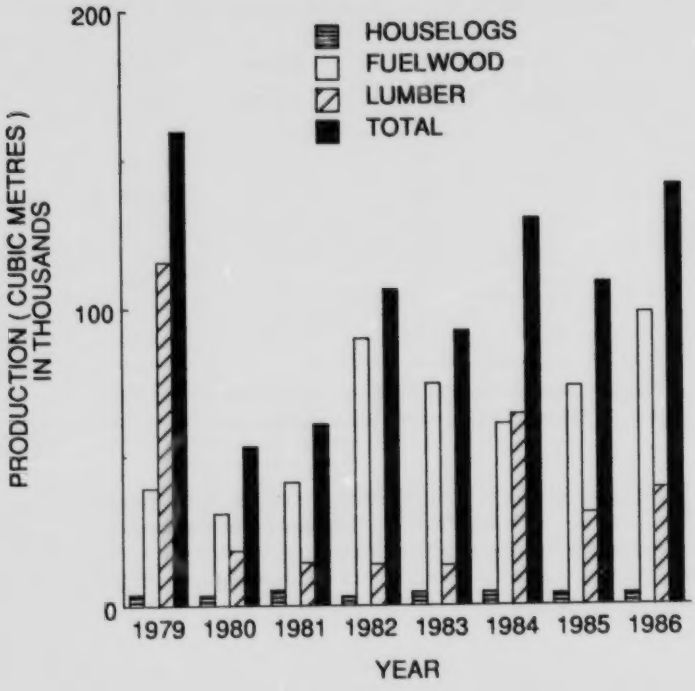

Figure 3. Yukon forest harvest 1891-1986

3.0 CURRENT FOREST INDUSTRY

The Yukon forest industry in June, 1987 appeared to be at a crossroads in its development process. On the one hand, the forest industry that was surveyed was essentially the same as it had been for the past fifteen years, with many of the same people and much of the same equipment involved in harvesting Yukon's forest resources.

On the other hand, there appears to be a much greater awareness by operators of the need to reinvest and revitalize the industry. Commencing in mid–1987, a few companies have begun to shift to newer manufacturing processes, newer harvesting techniques, and fuller use of the forest resources. Hyland Forest Products is undergoing a major modernization program, several logging firms have purchased new capital equipment, two new sawmills were purchased, one mill bought new planing facilities and Klondike Central Heating Ltd. is in the process of constructing a hot water heating system in Whitehorse that will utilize wood residues from forest production. In addition,the federal and territorial governments have spent more than $200 000 on studies in the past year in an attempt to identify opportunities in the forest industry and the Yukon Development Corporation, a Yukon government Crown corporation, purchased the Yukon's largest sawmill.

This section provides a profile of each of the forest industry sectors as of June, 1987. The profiles outline the basic industry structure, the operating characteristics, products sold, and value to the economy for each sector.

3.1 Basic Industry Characteristics

The basic characteristics of the forest industry cover a variety of factors, including the number of firms operating in the territory, the length that these firms have been operating, the income that owners derive from the business, the average age of the capital equipment that is being used, the total value of the investment in the industry, and the degree of concentration in the industry.

In summary, the industry consists of some 82 firms scattered throughout the territory (Table 5). On average these firms have been in business from 4-13 years and, are almost exclusively, owned by longer-term Yukon residents. These businesses are largely seasonal that operate in the colder months, complementing a variety of summer-seasonal activities. Most firms and employees do not generate a full-time income from these businesses but they do allow Yukoners the opportunity to obtain supplemental

income that provides for year-round employment. In June, 1987 the estimated capital investment in the industry, excluding wood manufacturers, was $4.75 million.

Total employment in the industry is estimated to be 121 person years and the average value of wages and salaries is estimated to be about $2.2 million in 1987. Average income per person year was estimated to be $15 700, just slightly above the Yukon average, but no single employee likely earned more than about half that total during the year. The industry is concentrated in Whitehorse and Watson Lake, but there are forest operators located in almost every Yukon community. Individual Indians and Indian Bands participate heavily in the forest industry with Indian firms and more than a third of employees being Indian. Each sector has its special characteristics, however, and they are outlined in more detail in the remainder of this section.

3.1.1 Logging

Logging is a highly seasonal business with the typical logging season running from November to February of each year. This allows firms to complement their winter logging activities with summer seasonal endeavors such as construction, transportation, and placer mining. As Table 5 illustrates, there were 14 logging contractors operating in the Yukon in the 1986/87 season. These tended to be either larger-scale contractors providing logging services to the five larger firms, who do not log themselves, or very small firms who assisted the remaining integrated logging/sawmilling operations on a short-term piece-work basis. The logging firms neither exported their logs from the territory nor exclusively harvested roundlogs for sale in the roundlog sector.

Logging businesses in the Yukon appear to be small individual or family-owned businesses, with only two firms having more than five employees. In total, forty–seven percent of the firms are single proprietorships, forty percent are small companies, and the remainder are partnerships (Table 6). There are four Indian-owned logging firms. Moreover, the majority of the Yukon logging firms have been in the business for many years. However, precise data could not be provided by many firms as there tends to be considerable entry and exiting from the sector depending on the profitability of alternative business opportunities.

As expected in a seasonal business, none of the firms reported that logging represented their sole income. Just over one quarter of the firms reported that logging now represents more than 75% of their income, a further 20% reported that it represented more than 50% of their income, and the remainder indicated that it provided less than 50% of their incomes (Table 7). As well, more than 95% of the logging sector in the Yukon is controlled by residents, almost all of whom have been resident Yukoners for at least fifteen years.

Total investment by the logging firms is estimated to be about $1.1 million in 1986/87 and includes logging trucks, skidders, loaders, forklifts, and other equipment used in the operations[16]. The large logging contractors have standard logging trucks but most equipment was adapted from the construction and transportation industries to meet logging requirements. In addition to standard equipment, two logging firms utilized homemade logging equipment in their operations.

Between 1982 and 1987, there was very little capital investment in logging, but in early 1987 there was some significant investment in new equipment amongst the largest firms. One firm, for example, spent more than $250 000 in obtaining new equipment, and two firms purchased rebuilt equipment to respond to demands in forestry, mining, and construction.

Precise information on the average age of the equipment were not possible, but equipment ranged in age from a few months to forty plus years. Most of the equipment ranged in age from 2-15 years and averaged between 8 and 9 years. However, it was clear that the majority of the equipment was in good condition.

3.1.2 Sawn lumber manufacturing

In 1986/87 there were 25 commercial sawmills located in Yukon, of which 17 were actively producing sawn lumber products during the year[17]. Figure 4 outlines the locations of the mills and their reported production. As the figure demonstrates, the industry is concentrated around Watson Lake and Whitehorse, with small operations in Mayo, Dawson City, and Haines Junction.

The sawn lumber manufacturing sector can be divided into two distinct components in the Yukon, namely: Hyland Forest Products, a medium-sized mill by industry standards and all other mills, who would be classified as small mills by industry standards. However, in order to be consistent with data available in other regions, and to protect the data from individual firms, the data has been loosely divided into three classes, namely: those firms producing less than 100 M fbm per year, those firms producing 100 M fbm to 1 MM fbm, and those firms producing over

1 MM fbm[18]. On this basis, Table 5 indicates that in 1987 there were 8 mills that produced less than 100 M fbm, 7 mills produced 100 M-1 MM fbm and only two firms that produced over 1 MM fbm.

This two-tiered trend in forest production in the Yukon is not distinct to the territory, however. Recent studies (Ondro and Williamson 1984, and 1985; Bohning 1986) indicate that the structure of the forest industries on the Prairies is tending toward a similar split between very large and very small firms. These studies provide data that show very large mills, who represent only 8% of the total

TABLE 5. Key forest industry characteristics for 1986/87

Forest Sector	No. of firms	Employment (PM)	Production (PY)	Quantity	Value ($ 000)	Total Wages and Salaries ($ 000)	Average Income Per Person Year ($ 000)	Capital Investment ($ 000)
Logging	14	161.0	13.4	38,754.00 m^3	574.63	283.26	21.12	1100.00
Sawmilling	17	146.1	12.2	6841.60 M fbm	1553.05	279.00	24.00	2902.00
< 100M	8	22.2		310.00	93.30	57.20	24.00	728.00
100M–1MM	7	60.9		2454.00	461.72	150.00	24.00	716.50
1 1 MM	2	63.0		4077.60	998.03	55.00	24.00	702.00
Comm. Fuelwood	25	753.0	62.8	68170.00 m^3	2257.78	1016.55	16.20	400.00
Misc. Roundwood	6	42.0	3.5	4011.00 m^3	140.85	57.60	19.20	250.00
Pine Cones	7	72.3	6.3	2170.00 hl	173.60	43.94	7.32	100.00
Wood Mfg.	13	272.0	22.7	na	na	522.24	23.04	na
TOTAL	82	1446.4	102.9		3984.43	2202.59	18.70	4752.00

SOURCE: Forest Industry Survey, DIAND–YUKON (files and records)

NOTE: See Appendix I for notes

TABLE 6. Ownership patterns in the Yukon forest industry

Forest Sector	Single proprietorship		Partnership		Limited liability		Total		Average Years of Current Ownership
	No.	%	No.	%	No.	%	No.	%	
Logging	7	50.00	1	7.14	6	42.86	14	100.00	na
Sawmills	9	52.94	3	17.65	5	29.41	17	100.00	12.53
< 100M	6	75.00	1	12.50	1	12.50	8	100.00	10.25
100M–1MM	3	42.86	2	28.57	2	28.57	7	100.00	21.33
1 1MM	0	0.00	0	0.00	2	100.00	2	100.00	1.50
Comm. Fuelwood	15	60.00	5	20.00	5	20.00	25	100.00	3.50
Roundwood	2	33.33	3	50.00	1	16.67	6	100.00	6.20
Pine Cone	4	57.14	3	42.86	0	0.00	7	100.00	4.10
Wood Manufacturers	9	69.23	1	7.69	3	23.08	13	100.00	
Total	46	56.10	16	19.51	20	24.39	82	100.00	

Source: Forest Industry Survey, 1987.

TABLE 7. Income derived from forest operations by logging firms 1986–87

Percentage of Income	No.	%
0–24	3	21.43
25–49	5	35.71
50–74	3	21.43
75–100	3	21.43
Total	14	100.00

Source: Yukon Forest Industry Survey, 1987

number on the Prairies, are responsible for more than 87% of the sawn lumber output, while the very small firms who represent more than 55% of the total number, are responsible for less than 2% of the output. In B.C. the concentration is even greater with less than 4% of the firms controlling 90% of the production. Moreover, the studies report that this is a long-term trend that will likely see the almost total elimination of medium-sized firms.

These recent studies also report that while small mills produce only a fraction of the total output, they appear likely to remain a strong component of the sawn lumber manufacturing sectors in these regions. The numbers of small firms actually grew by more than 40% in the Prairies over the past decade. The reason for the surprising strength of the smaller firms has been the fact that they developed small, but steady, market niches. These firms have concentrated on producing timbers, rough lumber, and small specialty products while the larger firms have concentrated solely on producing large quantities of standard dimensional lumber for building construction.

The sawn lumber manufacturing sector consists largely of longer-term residents who have committed many years to their seasonal operations. On average these producers have operated in the territory for more than 12 years (Table 8). The owners in the <100 M fbm range have been in business on average slightly more than 10 years, while those in the middle group have been in business for more than 21 years. Table 8 indicates that the owners, most of these Yukon manufacturing firms, have an equal or longer commitment to the industry than similar operators on the Prairies.

This long-term commitment to the forest industry by sawn lumber manufacturers tends to indicate that the combination of two complementary seasonal occupations provides a stable and reasonable income, but each occupation alone is not sufficient. In addition, the Yukon operators in this category are as committed to the resource as are firms in other regions.

One disturbing statistic on those firms producing less than 1 M fbm annually, was that 60% of the operators were over the age of 55 and few had family members interested in assuming the business. Several of these operators indicated a desire to leave the industry in the next few years, reducing the opportunity for business continuity. Moreover, there was only limited incentive for these owners to make significant new business investment when they could obtain better returns on alternative investments prior to retirement. New investors will have to be found within the next few years to replace these long-term Yukon residents once they leave the industry and efforts should be made to begin attracting new forest operators to the industry.

In the largest mill category, the operators have been in business for an average of 6 years. In both cases, the owners have a significant background in the forest industry and provide some confidence of a revitalization of the larger operations in the next few years. Hyland Forest Products is engaged in a multi-million dollar sawmill improvement program and the other firm is engaged in a longer-term planning process for reinvestment. The larger firms have a much shorter ownership record than on the Prairies, reflecting the recent move to investment in the Yukon.

Ownership in Yukon's sawmill industry is controlled exclusively by local residents, with 53% of the firms being single proprietorships, 18% being partnerships and the remaining 29% being limited liability companies (Table 6). Of course, the smaller the mill, the greater likelihood that it is owned by a single person. There is one Crown corporation and one Indian band corporation amongst sawmill firms. Total control of the forest industry in Yukon is unique as non-resident ownership in most regions controls from 30-60% of total production[19].

Sawn lumber production is not the primary occupation for most owners. Only 3 firms reported that they made 100% of their income from the forests, while an additional 6 firms reported that forest operations represented a majority of their income. Nonetheless, all but 2 firms reported that forest operations represented more than 25% of their income and most felt that it was a key element for year-round employment (Table 9). Sawmill operators felt that their seasonal winter-oriented forestry endeavors complemented their seasonal summer activities in the tourism, farming, placer mining, construction, and transportation sectors.

Milling equipment in the sawn lumber manufacturing sector consists almost exclusively of a single 48–52 inch circular head saw with a $^3/_8$"–$^5/_8$" kerf for use in both primary and secondary breakdown. Two firms use circular headsaws for primary breakdown into cants and use double arbour gang resaw equipment to produce the

Figure 4. Location of Yukon sawmill operators

TABLE 8. Average age and length of ownership for sawmills located in Yukon, Alberta and Manitoba

Sawmill Group	Yukon		Alberta		Manitoba	
	Years of Ownership	Age of Equipment	Years of Ownership	Age of Equipment	Years of Ownership	Age of Equipment
<100M	9	19	10	22	14	28
100M–1MM	18	27	12	19	12	15
<1MM	6	8	14	11	12	13
Independent Planer Mill	15	41	29	26	7	38

Source: Forest Industry Survey 1987, Ondro 1984, Williamson 1985.

smaller dimensional lumber in the secondary processing. One firm has a single band saw for complete breakdown. For enhanced quality, 60% of Yukon's mills have added a planer (Beaver or Alco) to the production process to produce green planed lumber. As well, four firms have added an edger and trim saw in the production process. One firm has both a sawmill and an independent planing facility with a basic scrag sawmill, an edger and four planers to meet customer demands[20].

While all of the sawmills, excluding Hyland Forest Products, are of portable design, only five of the 23 mills actually are portable, with the remaining mills being permanently stationed. This is in sharp contrast to similar operations in Western Canada where only the very large mills tend to be stationary. Part of the explanation may be the close proximity of available timber resources in the Yukon to the sawmill facility that is not the case in other regions. Haul distances in Yukon range from 5-60 km, while haul distances range from 27-100 km in the prairies. The lack of portability may also be an impediment to efficient milling operations for those stationary mills.

Total investment in the sawmill sector, as reported by the operators, is $2.9 million (Table 10). As expected, the majority of the capital investment is in mobile equipment such as skidders and loaders, with only about a third of the capital in June, 1987 being invested in mill equipment. Most of the mill equipment was purchased at least second hand, with the exception of some circular sawblades, and only one operator reported having any debt on his capital equipment.

The total cost of completely replacing the existing equipment has been estimated to be $14 million (Table 10). To replace the existing equipment for the 15 smaller mills would be around $1.7 million. However, the equipment is largely from another era and additional investment funds would be required if the industry wished to upgrade their equipment to meet new standards such as inline edgers, high speed saws, thin kerf sawblades, and automated infeed and outfeed decks. The two larger mills would require an estimated $4 million to refurbish the existing facilities. Hyland Forest Products has already spent millions to refurbish its mill. To completely replace the mills with new technology in completely enclosed modern mills could require up to $15 million each.

The age of the sawmilling equipment in the Yukon matches the long-term commitment with the smaller mills having equipment that is on average more than 20 years old, while those in the larger mills have new equipment averaging 7.5 years. Only two of the 17 mills have equipment that is less than 5 years old (Table 10). Moreover, the age of Yukon's equipment is not inconsistent with that in operation amongst the majority of firms on the prairies. The average age of equipment in the Prairie provinces is 19 years and ranges from 10–12 years for the larger mills and 15–28 years for smaller mills.

While sawmills can have a useful life of up to fifty years if maintained properly, the older age and poorer quality of some the equipment in Yukon's mills would tend to point to a need for reinvestment in the industry soon. This is more important if the industry wishes to expand into dimensional lumber production or specialty products. Across western Canada there has been significant new investments by large dimensional lumber mills (>40 MM fbm annually) in recent years and the average age of equipment in these plants is less than 7 years. These high production, high technology facilities are amongst the lowest cost and most efficient plants in the world today.

As well, there has been a trend recently amongst smaller mills in western Canada to move to more modern technology. Single portable bandsaws or traditional circular headrigs combined with more modern equipment such as multiple saw edgers and trimsaws, are used to improve quality without increasing labour or maintenance costs[21].

There is a significant vertical degree of integration

TABLE 9. Income derived from forestry by Yukon sawmill operators

Percentage of Income	Mill size <100MM	100–1MM	1MM	Total
0–24	2	0	0	2
25–49	3	3	0	6
50–74	2	1	0	3
75–100	1	3	2	6
Total	8	7	2	17

Source: Yukon Forest Industry Survey, 1987.

in the sawmill group in Yukon as the smaller firms are engaged in all phases of the production process from falling the tree to distributing the finished lumber. On the other hand, there is no horizontal integration as most firms have insufficient production levels to justify more than one mill in production at a time[22]. Fifty-two percent of sawmill companies are involved in logging, sawmilling, and planing while a further 30% do logging and sawmilling, and 29% of the firms specialize in sawing or planing (Table 11). This compares favorably to the Prairies where there is a similar percentage of firms that are engaged in all phases of the business, from log to final product delivery.

Specialization between logging, sawmilling, and planing tends to occur only amongst the very large operators where the production volumes justify the costs of contracting out the logging activities. As well, only the very large firms with sizeable stationary mills tend to be horizontally integrated, building several facilities throughout the region in order to overcome the disadvantage of being too far from the wood supply while still maintaining low production costs.

3.1.3 Commercial fuelwood

The commercial fuelwood sector has blossomed in the past few years as energy conservation measures, a widening price advantage in favor of wood over oil, minimal start–up costs, and increasing costs to private fuelwood gathering have encouraged the entry of new firms.

While the federal government issued well over 150 commercial fuelwood permits in 1986/87, it is estimated that there are only 25 private operators who consider fuelwood collection as a commercial business and a significant source of income. As well, all 12 Indian bands are involved in the harvesting of fuelwood to supply their communities [23] and there are four sawmill operators who sell fuelwood from their wood residues. As many as 30 other individuals or firms also have commercial fuelwood permits and are engaged in the sale of fuelwood on a part-time basis in order to supplement their income.

Commercial operators produced from 100–2000 cords annually, with the average serious firms producing between 1000 and 1200 cords. The commercial fuelwood operators are concentrated in the Whitehorse region where fully 70% of the fuelwood harvest occurs. Indian bands are responsible for the majority of the remaining activity in rural communities. Rural communities tend to have more domestic production due to the availability of fuelwood supplies in close proximity and the small markets tend to discourage local commercial operators in many communities.

Commercial fuelwood operators are generally single proprietors who hire cutters on a piece-rate basis (Table 6). Less than one-third of the operators are partnerships or incorporated companies, but these firms tend to be larger. The commercial operators also tend to be more transient in their involvement in the industry going into and out of the business depending upon the availability of other work. Hence the average years of ownership are short, less than 3.5 years (Table 6).

As with the sawmilling industry, less than 20% of the commercial fuelwood firms obtain their major income from fuelwood sales. Most operators were engaged in fuelwood harvesting as a seasonal occupation to supplement other work in complementary businesses, predominantly construction and transportation, where their capital equipment and time can be used most effectively. However, well over 75% of the firms indicated that fuelwood harvesting represented at least 30% of their total income and was a significant contributor to their annual incomes.

Commercial fuelwood harvesting is a completely Yukon controlled sector with Yukon residents cutting fuelwood from woodlots provided by the government under permit and they require only modest capital equipment to enter the business. Two or three chainsaws, axes, and a 1.5 ton truck (2.5 cords) or 3.0 ton truck (5 cords) is all that is required. Typical investments average $10 000 but can range up to $30 000 for a serious operator. There

TABLE 10. Value of the capital stock at Yukon sawn lumber manufacturers in June, 1987

	Number	Market Value				Replacement Value				Average Mill Age (Years)
		Sawline	Mobile ($000)	Other	Total	Sawline	Mobile ($000)	Other	Total	
Idle	8	204.50	508.00	45.00	757.50	602.00	1842.00	105.00	2549.00	17.70
<100M	9	304.50	408.00	15.00	728.00	916.00	1217.00	30.00	2163.00	18.67
100M–1MM	6	194.50	507.00	15.00	716.50	724.00	4522.00	30.00	5276.00	26.50
>1MM	2	315.00	387.00	0.00	702.00	1334.00	1720.00	1220.00	4020.00	7.50
Total	25	1018.50	1499.00	75.00	2904.00	3576.00	9301.00	1365.00	14 008.00	18.87

Source: Forest Industry Survey, 1987.

Note: Replacement values are based upon the following prices: 48" circular headsaw, infeed deck, carriage and power unit (Coutts 28–48F):$52,000 Edger 6"x48" heavy duty: $35,000; Beaver 49 planer: $60,000 Alco planer: $30,000; Cat–936 loader with grapple: $160,000 Cat. 518 line skidder: $116,505; D–7 Cat. with blade: $305,000 Ford log truck: $150,000; Ford 5–ton: $35,000; Forklift: $65,000 Case tractor: $40,000. Repalcement price data obtained from Almac Machine Works, Firming Tractor and Brown Brothers Ford. Data for replacement value of Hyland Forest Products mill is based upon an estimate of the total cost to refurbish the mill and equipment and not on the actual price for a new 1,000,000 fbm/shift mill which could cost up to $15 million to install.

TABLE 11. Vertical integration of sawmill operations in Yukon

Sawmill group	No. of Mills				
	Logging, sawmilling and planing	Logging and sawmilling	Sawing and planing	Sawing only	Total
< 100M	2	4	1	1	8
100M–1MM	4	1	1	1	7
7 >1MM	1	0	1	0	2
Total Sawmills	7	5	3	2	17

Source: Forest Industry Survey 1987.

are three automated processing systems in the Territory. Total investment in this sector is estimated to be $400 000[24].

3.1.4 Houselog production

The houselog market is a small stable forest sector dominated by firms engaged in the construction of natural log homes for use by local residents. This sector is dominated by skilled log home artisans but includes one log cabin company, Klondike Log Cabins, of Watson Lake. As well, several of the sawmills sell milled cabin logs directly to customers.

There were six commercial firms producing houselogs in 1987, with the majority of the firms being either owner-operated or partnerships. Only two firms employed more than four people and only one firm was a corporation. The log homes are either constructed on the customer's site or built in a yard, then dismantled and moved to the site and reassembled.

This sector is extremely labour intensive with firms using only hand tools, small hand power tools such as chainsaws, routers and skill saws and on occasion a small front–end loader or forklift. Klondike Cabins is the only firm with any amount of capital equipment, including planers, trim saws, and other equipment to assist in the production process. Total investment in the industry is estimated to be about $250 000.

The owners in this sector were long-term Yukon residents with the average business being 6.2 years old (Table 6). This small sector has provided a good seasonal employment opportunity for these owners who normally pursue other full-time careers in the winter months. The market is not large but it has been extremely stable since the turn of the century.

3.1.5. Pine seed producers

Pine seed production has been a steady seasonal income source over the past few years as the Yukon emerged as an important source of lodgepole pine seeds for northern and high elevation planting sites in Sweden. The increasing use of lodgepole pine in Swedish reforestation programs, coupled with its consistent yield, have significantly affected the Yukon industry in recent years.

This small sector of the forest industry has seven small firms who act as contractors for three major cone buyers in British Columbia. Pine seed producers have been in the business for an average of slightly more than 4 years with most of the firms being single proprietorships that hire pickers on a piecework basis. As well, there are some partnerships among the contracting firms (Table 6).

Pine cones can be picked on a year-round basis, except in August when the cones are green, but most producers operate in the fall on a season lasting 30–40 days. The majority of the seeds are harvested by raiding seed caches of squirrels or picking cones from logged areas.

Investment is small, requiring only a chainsaw and transportation to the picking sites and income from the production is used solely to supplement other income sources for the firms. Total investment is estimated to be about $100 000 for the entire sector.

3.2 Operating Characteristics

3.2.1 Production and value

Total forest production in the Yukon in 1986/87 was 140 851 m^3. The sawn lumber manufacturing sector was responsible for 27.5% of the total, producing 38 754 m^3, while the commercial fuelwood sector produced 68 170 m^3 or 48.4%, domestic fuelwood produced 29 915 m^3 or 21.4%, and the roundlog sector only 4011 m^3 or 2.3% of the total supply (Figure 5). The pine seed sector added 2170 hectolitres of pine cones.

Whitehorse and Watson Lake were the largest forest products-producing areas, accounting for 55.6% and 12.2%, respectively. Carmacks, Dawson City, and Mayo

each contributed slightly more than 6% of the production, with the remainder being spread out relatively equally amongst the other rural communities (Figure 6).

Total production varies considerably between market areas. Sawn lumber manufacturing dominates production in Dawson City, Mayo, Watson Lake, and Beaver Creek, while fuelwood production is the major product produced in the remaining communities. Watson Lake was the largest sawn lumber manufacturing centre, while two-thirds of the total fuelwood production comes from Whitehorse.

Sawn lumber production also varied amongst the various firms. Hyland Forest Product's predecessors produced about 85% of the sawn lumber products in the Yukon, but in 1986/87 only a third of the supply was provided by the larger firms. The mills in the 100 M–1 MM fbm category were responsible for 52% and the very small mills contributed the remaining 15%.

Figure 7 shows that the value of the production in 1986/87 was estimated to be $5 195 850 for all forest products. Fuelwood production again dominated values at $3 248 608 (62.5%), with commercial fuelwood production at $2 257 780 (43.5%), and domestic fuelwood production at $990 828 (19.1%). This was followed by sawn lumber manufacturing at $1 553 050 (29.9%), roundwood at $140 851 (2.7%), and pine seeds at $173 600 (3.3%). On a value per m^3 basis, sawn lumber provided $40.07 per m^3, houselogs provided $35.12 per m^3, and fuelwood provided $33.12 per m^3. Pine seed production was valued at $173 600 in 1986/87.

Production values were spread throughout the territory in about the same distribution as the physical volume of production. Figure 8 outlines the distribution of the value, with Whitehorse and Watson Lake taking the majority of the revenue, followed by Carmacks, Dawson City, and Mayo. The remaining communities obtained only about 10% of the revenue.

3.2.2 Capacity

In recent forest studies in the Yukon (Peschke 1986; Deloitte, Haskins and Sells 1986), there has been real concern expressed that the existing forest industry was underutilizing its existing capital stock by not producing at its full physical capacity[25]. In part, the viability of the industry depends upon the degree to which this capital stock is utilized, particularly in relationship to competitors.

Ideally, it would be appropriate to determine the degree that each sector meets its productive capability. However, data for most sectors in the industry are unavailable as they do not lend themselves well to an evaluation of capacity utilization. Reasonably good empirical data, however, were available for the sawn lumber manufacturing sector.

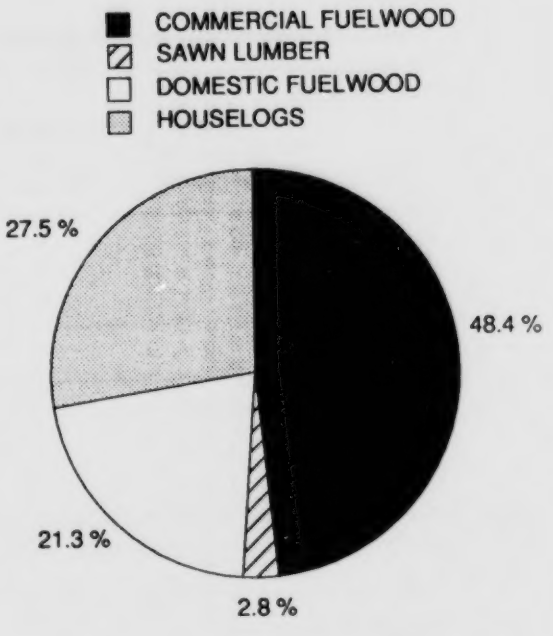

Figure 5. Forest production in the Yukon by product (1986/87)

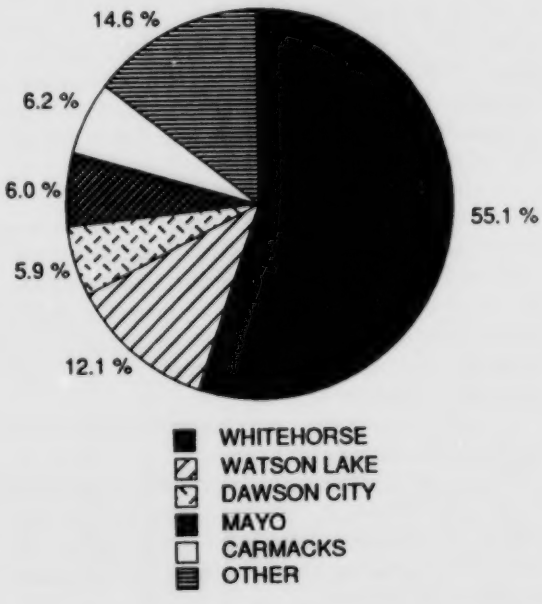

Figure 6. Forest products production by community in the Yukon (1986/87)

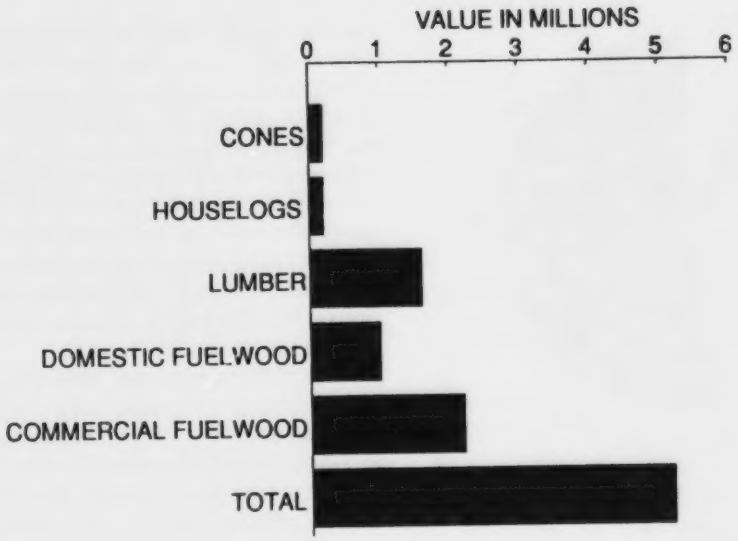

Figure 7. Value of production by product (1986/87)

Table 12 provides information on the installed process or engineered capacity for the various types of sawmills in the Yukon[26]. On the assumption that the Yukon sawn lumber manufacturing sector can obtain access to adequate timber supplies, and there was sufficient demand, the maximum capacity of the sector is presently 45.8 MM fbm on the basis of an 8-hour shift and 91.6 MM fbm on a two-shift basis (Table 12). The additional output from a second shift would normally be available with limited additional capital investment.

Total engineered capacity amongst the mills ranged from 66 000 fbm for the 8 very small mills to 110 M fbm/8 hr shift for the large mills, with the maximum engineered capacity being 100 M fbm per 8 hr shift. On the other hand, total operating output in 1986/87 was significantly lower, ranging from 12 M fbm per 8 hr shift for the eight very small mills to 24 M fbm per 8 hr shift for the larger mills.

Sawmills with annual production greater than 1 MM achieved an average operating ratio per 8-hr shift of 11.0% of their engineered capacity. Hence the mills were operating at only 11% of their designed capability (26). Mills with annual production of less than 100 M fbm had an operating ratio of 8% while mills with production between 100 M and 1 MM fbm had an operating ratio of 18.5%[27].

The three categories of sawmill operation being significantly under-utilized indicates that the industry is having difficulty. The problem is compounded when you compare Yukon's performance to similar firms in western Canada (Table 13). In Alberta, the very small firms were able to produce at a minimum of 59% of engineered capacity, while similar NWT mills achieved levels of 41% of engineered capacity. For mills in the 100 M–1 MM fbm range, Yukon mills faired better against the other regions but the excess capacity of these mills was still significantly greater[28]. Again, for the large Yukon mills, there is significant under-utilized capacity when compared to the Prairies and the problem is even worse when one considers that very large sawmills of the BC interior are presently operating at rates in excess of 94% of their engineered capacity. Yukon firms need to increase capacity utilization in all categories.

3.2.3 Products and markets

In 1986/87 the Yukon forest industry continued to produce the traditional range of items, including natural and milled houselogs, fire-killed fuelwood, rough dimensional lumber, specialty items, and pine seeds. Some wood residue was beginning to be harvested for local use, but most firms based their operations on a narrow range of products or services.

Almost 100% of the sawn lumber was white spruce (85%), or pine (15%). Very little production from specialty species, such as birch or poplar, occurred during the year, although four firms indicated that they were experimenting with alternate species for use in interior decorative situations, such as walls, stairs, and floors.

Commercial fuelwood operators predominantly harvested fire-killed spruce and pine, while a few opera-

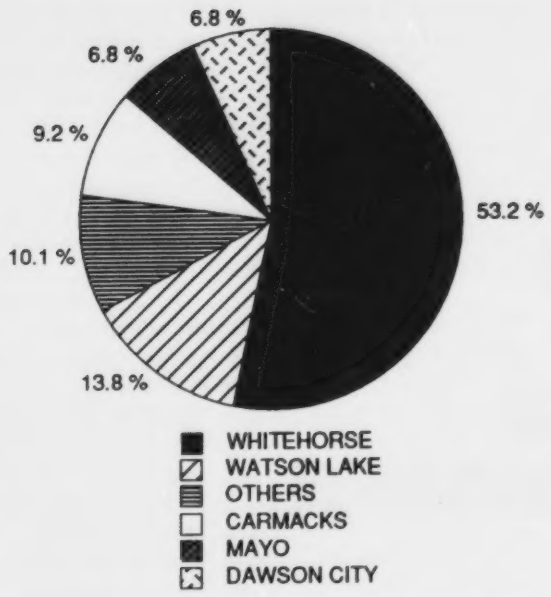

Figure 8. Regional distribution of the production revenues in the Yukon (1986/87)

tors used green trees for fuelwood stock. In Dawson City, slabs from the local sawmills provided a major source of fuelwood, while wood residues are used by Hyland Forest Products to provide heat and power to the mill.

Sales by commercial fuelwood operators were largely in the local market (within 50 miles of the plant), with domestic consumers being the most frequent client. In addition, one operator sold about 100 cords of fuelwood to Skagway in 1986/87.

Sawn lumber manufacturers in the Yukon sold a variety of green sawn lumber products. Table 14 categorizes the 4664 M fbm of sawn lumber products that were sold in 1986/87. Rough timbers for placer mining stakes and mine timbers were the major products sold accounting for 43.5% of the output. Dimensional lumber accounted for 28.5% while houselogs had 18.2% of the output and boards made up 9.8%.

While most of the lumber is used in rough-sawn form, some is planed prior to sale. Most of the planed material was in the form of milled house logs, finishing materials (siding, paneling), or furniture stock. There are 7 small mills that have planers in place to complement their circular saws but only 4 of the firms utilize the equipment regularly as part of their sales program.

All of the Yukon sawn lumber in 1986/87 was sold air–dried or green (some being sold on the day of manufacture), and was not graded according to the Canadian Lumber Standards. In mid–1987, Hyland Forest Products became the only Yukon firm to officially grade its lumber prior to sale[29]. During the Yukon Forest Industry survey, six of the sawn lumber manufacturers indicated an interest in grading their lumber, but the majority of the firms felt that their customers largely buy mine timbers, not needing to be graded for wood quality. Without grading the lumber to Canadian standards, however, the local markets for standard construction lumber are not available to Yukon firms and export markets of all products will be severely restricted. Heartwell (1987) indicated the need for Yukon firms to begin grading their lumber if they wish to expand markets and increase production.

In 1986/87 more than 90% of the total output by Yukon sawn lumber manufacturers went to immediate local markets. Three mills sold a portion of their products to Yukon markets more than 50 miles from the mill and two mills exported very small quantities of their sawn lumber to Alaska. This is in sharp contrast the the millions of board feet of sawn lumber that was sold into the Mackenzie Delta and interior Alaska in the late 70's.

Throughout the latter half of 1987, Hyland Forest Products was able to begin making new inroads into various markets with sales to British Columbia, Alaska, and the United Kingdom, in addition to sales within the Yukon. Other mills continued with more modest sales despite a strong housing market in the territory[30].

Sawn lumber manufacturers are not only integrated backwards to the logging sector, they are also integrated forward into marketing. Each mill sells almost all of its product directly to the final consumer and only Hyland Forest Products uses a paid sales group.

Five of the sawmills sell almost all of their production on contract to mining companies and two of the idle firms are in the process of negotiating contracts for the sale of timbers and cants directly to a single buyer. Most of the remaining production is sold directly to individual consumers, with modest sales going to the six retail lumber outlets in the territory.

One of the sawn lumber manufacturers maintains a retail outlet in conjunction with the milling operation, while another firm does custom planing for other mills and retailers, producing a variety of specialty products from green, rough, or kiln-dried products.

Unlike other regions, Yukon has no sawn lumber manufacturers involved in remanufacturing lumber products from culled sawn lumber. Remanufacturers use various types of laminating equipment such as finger jointers and Edge Dry Glue and Rip (EDGAR) laminating systems to produce higher quality products from a variety of materials.

While fuelwood operators were able to directly meet the needs of the domestic consumer for fuel, the sawn lumber manufacturers in 1986/87 appeared to be unable to fully supply existing demand. In a previous study

TABLE 12. Engineered capacity, normal output and operating ratios

Sawmill Group	No.	Total Enginered Capacity/ 8 Hr Shift	Av. Shifts Per Week	Standard Operating Days*	Total Annual Capacity (M M fbm)	Total Operating Output/ 8 Hr Shift	Average Operating Days	Operating Ratio Per 8 Hr Shift
< 100M	8	66 000	5	60	3900	12 000	25.88	0.080
100M–1MM	7	166 000	5	120	19 920	71 300	51.71	0.185
> 1MM	2	110 000	5	200	22 000	24 000	100.00	0.110
Total	17				45 820			

Source: Forest Industry Survey, 1987.

Refers to the normal operating season for each firm size based on firm activities in the Prairie provinces and the NWT.

TABLE 13. Average operating ratios for Yukon, NWT, Alberta, and Manitoba

Sawmill Group	Yukon	NWT	Alberta	Manitoba	Saskatchewan
< 100M	0.08	0.16	0.59	na	na
100M–1MM	0.19	0.67	0.48	0.70	0.60
> 1MM	0.11	0.41	0.64	0.69	0.66

Source: Yukon Forest Survey 1987; Ondro and Williamson 1984 and 1985; and Bohning 1986.

TABLE 14. Estimates of product demand and supply in the Yukon forest industry 1986/87

Product	Market Share (%)	Product Demand (M fbm)	Product demand by Kiln dried	Type Green (M fbm)	Product Supply
Boards	10.0	1491	1193	298	456
2x2	1.4	209	198	10	
2x4	30.3	4518	4292	226	
2x6	18.7	2788	2649	139	1330
2x8	12.9	1923	1827	96	
2x10	8.9	1327	1261	66	
2x12	3.2	477	453	24	
3x	0.9	134	0	134	
4x	6.9	1029	0	1029	1476
6x	3.4	507	0	507	551
HL	3.4	507	0	507	851
Total	100.0	14 910	11 873	3037	4664

Source: Yukon Forest Industry Survey, 1987. Data on market share are based upon material in Peschke, 1986, p. 51.

(Heartwell 1987) on markets for Yukon forest products, it was found that total demand for spruce, pine and fir products in the Yukon amounted to 14.91 MM fbm in 1986/87, but production by local manufacturers totalled only slightly more than 6 MM fbm.

Using the consumer demand patterns provided by Peschke (1986), Table 14 shows that demand for the green or air-dried materials produced by Yukon firms is only 3 126 670 fbm , more than a million fbm short of the supply. Moreover, this demand accounted for only 21% of the total consumer demand in the territory, while the demand for kiln-dried construction materials not produced by Yukon firms was 11 873 M fbm, or more than 79% of the total.

This indicates that Yukon firms are easily able to supply the consumer demand for timbers and rough dimensional lumber, but they are not able to meet the majority of consumer requirements for basic building materials.

Long-term development of the forest industry will require that Yukon firms be in a position to better match production to demand. The refurbishing of Hyland Forest Products is likely to substantially increase the capacity of that firm to meet the dimensional lumber demand of Yukon consumers, but other firms presently do not appear to be in a position to effectively meet these consumer needs.

Houselog firms supply a standard natural house log home to a small but stable clientele in the Yukon. Each year an estimated 4000 m^3 of houselogs are converted into approximately 20-25 dwellings located throughout the territory. The demand for these products has remained relatively constant throughout the past eighty-five years and can be expected to continue for some time. As with sawn lumber manufacturers, houselog firms tend to have forward integration into marketing.

Pine seed producers provide lodgepole pine cones to established seed buyers in BC who process and sell the seed to buyers in Sweden. Again the market for this product has remained reasonably stable as production occurs only after firm orders are obtained. Pine cone collectors pick to order and therefore do not presently need to market their products. However, Yukon firms pick few spruce seed and if they wish to expand into more spruce or pine seed production, further markets must be developed.

3.3 Employment and Economic Impact of the Industry

In 1986/87 the commercial forest industry in the Yukon provided 1440 person months of direct employment (Table 15). The commercial fuelwood operators were the largest employers, providing 753 person months of employment or 52.5% of the total. Logging and sawmilling provided 310 person months or 21% of the total employment, while the wood manufacturers provided 272 person months of employment or 19.0%. The remaining 98 person months was provided by the houselog and pine seed producers. If employment value of domestic fuelwood production was added there would be an additional 330 person months of direct employment, while the Indian fuelwood production facilities for band use contributes an estimated 125 person months[31]. Employment was largely concentrated in Whitehorse where most of the commercial fuelwood and manufacturing facilities exist and many of the pine cone pickers reside.

As expected there was a definite seasonal employment pattern in the Yukon forest industry. During a 6-month period (November to March) nearly all logging associated with sawmill operations was completed. Access to the majority of logging sites is usually possible only during the winter months, when the ground is frozen and inexpensive temporary roads can be constructed. Most commercial fuelwood operators also produced the majority of their products during the fall and winter months.

Almost all sawmilling occurs during the spring and early summer, May to July, with some firms restarting their operations in late September and October if demand exists. In most firms the loggers double as mill workers, doing the jobs at different times of the year. The available labour force appears to be adequate but three operators did feel that there was a shortage of skilled sawyers in the Yukon.

While most owners did not wish to indicate the percentage of Indians in their operations, it was noted that there were four Indian businesses in the logging and sawn-lumber manufacturing sectors and one in pine cone production. All twelve Indian bands have fuelwood operations and several commercial fuelwood producers are Indian. And the Yukon Indian Development Corporation bought the largest wood manufacturer in the Yukon in late 1987. In total about 500 person months, or a third of the total employees in the Yukon's forest industry in 1986/87, were Indian. Clearly, the forest industry is important to Indian people.

The total employed labour force in the Yukon in 1986 was 11 358 persons (Yukon Bureau of Statistics 1987). With approximately 121 person-years of employment in the forest industry, forestry contributed just over 1% of the total employment in the territory. This would place it well above fishing and agriculture but well below most primary producing sectors.

Table 5 outlines the total value of wages and salaries in the various sectors, along with the average income per person year. In total, the wages and salaries were estimated to be $2 202 590 in 1986/87. The commercial fuelwood sector contributed the most to the wage and salary bill followed by the logging/sawmilling sectors. Wood manufacturing contributed well over half a million

dollars, while the other sectors contributed much less. Wages and salaries represented about 35% of the total value of the forest industry in 1986/87 and represented the largest single expenditure amongst the forestry groups.

The average income for the forestry sector is just above the median income for all individuals filing tax returns in the Yukon. The median income levels for all Yukoners was $15 422/ person yr. in 1985, while the average annual income in the forestry sector was $15 700/ person yr. The average incomes of the logging and sawmilling sectors were higher than that for the other sectors, but most forest sector's employees did not work for a full year and would not earn these average incomes[32].

The reopening of the Hyland Forest Products mill is expected to significantly enhance the effect of the forest industry on Yukon's economy in 1987/88 and subsequent years. During the 1986/87 year, the mill was operated for only a few weeks in order to process the log inventory held by the receiver and activity was limited to logging. The mill reopened in May, 1987 and employment climbed from 17 during that month to 55 in September, 1987.

Over the course of the 1987/88 fiscal year, there is expected to be about 480 person months of employment in the mill and 121 person months of employment in the logging industry. This should double the employment levels and provide more than $1.2 million in wages and salaries, boosting the expected annual total for the industry to almost $3.5 million (Deloitte, Haskins and Sells 1986).

In addition to the direct impacts of employment and income on the Yukon's economy, the forest industry activity creates demands for industrial goods and services produced by other sectors of the economy. As well, the incomes of forest industry employees further increase the economic impact through local expenditures on household goods and services.

This multiplier effect, as it is called, will consist of the direct employment created by people employed in the forest industry and the indirect employment created as a result of the activity such as those personnel employed in local retail outlets, those employed in supplying the forestry complex with intermediate goods and government employees required to maintain community services[33].

Various estimates of the multiplier effect in the forest industry have been made over the past few years. Table 16 outlines the estimates of the multiplier impacts for Canada and various provinces. As you can see the average multiplier ranges from 1.879 to 2.760. Of course, the multipliers are higher in the provinces in which more of the supplies and services to the forest industry are produced in that province and the goods from the industry sold in that province[34].

Table 15 outlines the employment impact on Yukon by forest sector. On average, in 1986/87 Yukon's forest industry created 0.64 person months of employment indirectly for each direct person month of employment. Overall, there were 931 person months of extra employment created in the economy in addition to the 1440 person months directly employed in the forest industry. This means that in total there were 2371.0 person months of total employment generated by the forest industry.

If the impact of the Hyland Forest Products employment is added, there would be a further estimated 480 person months of employment in the sawmill and 120 person months in the logging sector. With a multiplier of 2.803 and 1.424 respectively, this will bring a total employment impact of 1517.7 person months of additional employment or 126.5 person years. This is almost equal to the total impact of the entire forest industry in 1986/87.

While the economic effects of the forest industry appear to be small in comparison to the total employment in the economy, the impact of the forest operations goes beyond just employment. As indicated earlier, the forest industry is a winter seasonal business and one that is complimentary to other summer seasonal activities. Therefore, many Yukoners are able to use a combination of seasonal activities to ensure full-time employment and to obtain higher incomes than would otherwise be available.

The forest industry also provides a significant boost to the rural communities of Dawson City, Mayo, and Watson Lake. The Watson Lake economy especially depends upon the forest industry. Two significant forest businesses operate out of Watson Lake and forestry has historically been the town's largest industry. The Whitehorse Star indicated that the Hyland Forest Products operation alone would generate more than $3 million in goods and services each year in the local economy. The mills in Dawson City and Mayo also provide a steady employment base that helps to diversify the economies of these communities.

TABLE 15. ECONOMIC IMPACT OF THE FOREST INDUSTRY IN THe Yukon (June, 1987)

Forest Sector	Firms (No.)	Direct (PY)	Employment (PM)	Indirect (PY)	Employment (PM)	Total (PY)	Employment (PM)	Multiplier
Logging	14	13	161	6	68	19	229	1.424
Samilling	17	12	146	22	263	34	409	2.803
<100M	8	2	22	3	40	5	62	2.803
100M–1MM	7	5	61	9	110	14	171	2.803
>1 MM	2	5	63	9	114	15	177	2.803
Comm. Fuelwood	25	63	753	27	319	89	1072	1.424
Misc. Roundwood	6	4	36	3	33	6	69	1.912
Pine Cones	7	6	72	5	66	11	138	1.912
Wood Mfg.	13	23	272	15	182	38	454	1.670
Total	82	121	1440	78	931	198	2371	1.642

Source: Forest Industry Survey, DIAND–YUKON (files and records)
Note: See Appendix II for notes.
Appendix II–3 Yukon forest harvest by product 1974/75 – 1985/86

TABLE 16. Employment multipliers in other regions

Industry Group	Alberta	Manitoba	Ontario	B.C.	CFS
Logging	na	1.424	1.690	na	1.400
Sawmills	1.814	2.803	2.150	na	na
And Planing Mills	1.824	2.803	na	na	na
Misc. Roundwood	1.907	1.912	2.290	na	na
Wood Mfg.	1.907	1.617	na	na	na
Pulp and paper	1.813	3.257	2.280	2.430	na
Total	1.879	2.342	2.070	2.490	2.760

Source: Alberta Data–Ondro and Williamson (1982); Manitoba Data–Bohning (1986); Ontario Data–Ondro and Williamson (1982); B.C. Data–Ondro and Williamson, (1982); and Canadian Forestry Service (CFS) Data–Jacques (1988).

4.0 PRODUCTION COSTS AND REVENUES IN THE FOREST INDUSTRY

The viability of Yukon's forest industry depends upon two basic factors, namely; the ability of firms in each sector to produce their products at the lowest possible costs and the ability of these same firms to be able to supply the necessary products demanded by the consumer at those minimum cost levels. The first part of this section, therefore, measures the production costs in Yukon to see if they are reasonable and determine if there are means to reduce those costs. And the second part deals with determining if Yukon firms are using their capital equipment to produce the required goods or services, in the face of local, regional, and world competition. Clearly, a major conclusion from section 3 was that Yukon firms in the sawn lumber manufacturing sector have been unable to match their production to meet consumer demand during 1986/87.

In this section, the study examines the production costs in each sector of the industry using data obtained from the Yukon Forest Industry Survey, complemented by data from Statistics Canada, and government records[35]. In turn, the production costs for Yukon firms are compared with available production costs in other regions in order to assess the competitive position of each sector[36].

In this section there is also a discussion of the efficiency of various forest industry sectors in order to determine if opportunities exist in various sectors for firms to reduce their overall costs, improve profitability, and boost sales.

4.1 Competitive Position

4.1.1 Logging

Logging firms and integrated sawmill owners reported that logging costs in the Yukon averaged $16.99/m³ of sawlogs (about $96.39/M fbm of equivalent lumber output) in 1986/87[37]. These costs differed slightly depending upon firm size, with firms (<100 M) in the smallest category facing average costs of $14.99/m³, the middle firms (100 M - 1 MM) facing average costs of $16.30/m³ and the larger firms (1 MM) having average costs of $17.60/m³ (Table 17). Logging costs, however, did range from a low of $13.20/ m³ of sawlog harvested to a high of $19.71/ m³. The largest portion of the logging cost, $8.01, went to falling, skidding, and loading the logs. A further $6.41/m³ went for constructing roads and hauling out the logs. The remaining $2.57/m³ was spent on supervision, stumpage, and administration associated with the project. Figure 9 breaks out the logging costs by major element.

The costs for falling, skidding, and loading were fairly similar amongst reporting operators, with the major differences in log costs being attributable to the distance between the wood supply and the mill and the ease of access to the cutting sites. In many instances operators were within 5 km of their operation and could build roads and move their product to the mill for under $3/m³. Other firms faced one-way log hauls as long as 48 km and experienced costs of $6.00-$6.50/m³.

The ease of access was also important. Winter is the preferred harvesting time as the ground is frozen and access can usually be obtained using less sophisticated road construction. Nonetheless, access costs can still range from $2 000 to $6 500/ km and may on occasion rise to as much as $10 000/ km depending on terrain. These costs also escalate rapidly if ice bridges are required or if

more kilometers of road must be built to harvest wood from stands that are discontinuous.

Logging costs in the Yukon are not significantly out of line with those experienced in other regions of western Canada (Table 17). The costs are somewhat higher than those experienced in the flatter terrain of northern Saskatchewan, but lower than those experienced in equivalent forest stands in northern Alberta and the Ft. Nelson region of B.C. The logging costs are also similar to those in the NWT, where production is largely concentrated in the southwest Mackenzie region in forest stands similar to Yukon.

In part, costs are more competitive because most mills appear to be much closer to the wood supply than in other regions. Table 18 indicates that for every mill size, Yukon firms have much shorter haul distances than on the Prairies. Yukon firms have haul distances from 5-42 km on average, while the haul distance on the Prairies will range from 22-100 km. Prairie operators on the other hand, generally tend to have a better developed logging infrastructure that partially offsets the distance factor.

Logging costs consistently rise across all regions as mill size increases, especially for the largest sawmills (Table 17). Smaller mills usually locate close to or in the wood supply, thus reducing wood costs, while large firms harvest large volumes of timber over a broad region and trade higher wood costs off against the lower manufacturing costs of their efficient mills.

Yukon has the lowest stumpage rates in western Canada and Alaska, a positive contributor to the competitive logging costs in the territory. Stumpage rates in other western Canadian provinces for spruce and pine species ranged from \$0.45-\$8.49/m³ in 1986/87, while those in Alaska averaged \$3.30/m³ (\$18.80/M fbm). In the Yukon, the stumpage rates are set at a flat fee of \$0.20/m³ harvested. Stumpage rates in northern B.C. were among the lowest rates, but they still ranged between \$0.45 and \$1.52/m³, thus providing a cushion of \$2.00-\$7.00/M fbm on sawn lumber manufactured from most Yukon firms[38].

This stumpage advantage could grow in favor of the Yukon if the new stumpage fees in British Columbia continue to remain in force. The stumpage policy was changed in the interior of B.C. in October, 1987 and stumpage fees rose from an average of \$1.52/m³ to \$9.86/m³ [39]. This would provide Yukon firms with a cushion of more than \$9.50/m³ or \$55/M fbm.

4.1.2 Sawn lumber manufacturing

Sawn lumber manufacturing can be broken down into four phases; the cost of logs delivered to the sawmill, labour costs in lumber production, operating costs in the plant including energy, maintenance, and administration, and selling or delivery costs incurred in marketing the product.

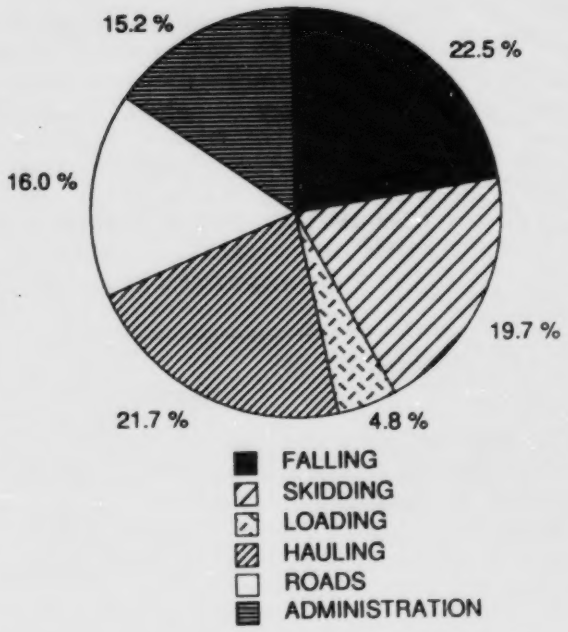

Figure 9. Logging cost comparison by activity

The Yukon Forest Industry Survey showed that the cost for the manufacturer to place logs at the millsite was \$96.39/M fbm. The actual costs to produce sawn lumber added a further average cost of \$140.69/M fbm during the 1986/87 season[40], with the median costs being \$146.00/M fbm, and overall costs ranging from \$116-\$170/M fbm (Table 19). Those firms who produced planed sawn lumber products, from dimensional lumber to houselogs, had costs that were at the high end of the range while operators producing rough timbers had costs near the lower end of the range. Most operators confirmed that they could produce rough lumber for \$30-\$40 below the production costs for similar planed material, suggesting that planing costs are around \$35/M fbm.

Labour costs, as expected, represented the largest manufacturing cost component. Labour averaged \$72.37/M fbm of lumber produced or 51.4% of the total manufacturing costs and ranged from a low of \$48/M fbm to a high of \$112/M fbm. However, most firms had labour costs bunched around the \$63-\$73 mark. As expected, several owners did not pay themselves wages but took their income out of profits, a factor which tended to depress the actual labour costs[41] (Figure 10).

Operating and maintenance costs were the second most significant component, with average costs of \$39.78/M fbm. The operating and maintenance costs ranged from \$22/M fbm to \$85/M fbm but most firms' costs were in a much narrower range of \$50-\$72. Electricity costs were

TABLE 17. Logging cost comparisons ($/unit) in western Canada 1986/87

Firm size	Region NWT		Yukon		Alberta	
	m^3	M fbm	m^3	M fbm	m^3	M fbm
<100M	na	na	14.99	85.17	na	na
100M–1MM	15.84	90.00	16.30	92.60	23.00	98.71
>1MM	17.13	97.37	17.60	100.00	27.00	115.88

Firm size	Region Saskatchewan		Manitoba		B.C.	
	m^3	M fbm	m^3	M fbm	m^3	M fbm
<100M	na	na	na	na	na	na
100M–1MM	12.73	54.65	13.82	59.32	27.96	118.46
>1MM	21.47	92.15	34.07	146.23	30.05	129.23

$12.74/M fbm, and administration, marketing, and interest were $14.76/M fbm. Energy costs ranged from $7-$23/M fbm depending largely on the size of the operation and the type of power used. Administration costs in some cases were much lower because the firms are small family-run businesses where the owner assumes a number of functions in production, distribution, and management.

The cost of selling the product was difficult to assess accurately, as individual firms used varied marketing techniques to sell their products. Many firms, especially those located close to communities, used only word of mouth advertising and customers removed the material at their own cost. In other cases, the mill had a contract for sale to a local mining firm which included transportation costs to the customer's plant. Others had a combination sales approach in which small orders where purchased by the consumer at the site and larger orders were delivered.

The marketing and sales costs varied from zero, where customers removed the material themselves, to $50/M fbm for lumber delivered to the buyer. The average marketing costs were $1.04/M fbm and transportation costs were $38.75/M fbm.

While logging costs in the Yukon are competitive with other regions, manufacturing costs were significantly higher than other areas. Table 20 outlines the costs of producing sawn dimensional lumber in the NWT, Yukon, and northern B.C. The table shows that northern B.C. firms could produce kiln-dried dimensional lumber, excluding tax, at the mill gate for an average of $197.46/M fbm, while Yukon firms produced the material for $245.08/M fbm, and NWT firms produced it for $230.42/M fbm. This provides the average interior B.C. firm with a cost advantage of almost $50.00/M fbm, and according to the Northern Interior Lumberman's Association, the advantage can be more than $75/M fbm. Many interior B.C. firms have manufacturing costs as low as $77/M fbm and can sell lumber at the mill gate for as little as $179.00/M fbm[42].

Yukon sawn lumber manufacturers do not appear to be cost competitive overall with southern firms, yet many of the mills in the territory have operated for more than 20 years. The fact that Yukon firms could compete appears to depend upon the natural tariff barrier of transportation, the products sold, and the sales techniques.

Yukon firms have a natural tariff barrier caused by the added transportation costs to get the product from southern centres to the Yukon market. Smithers producers are the major competitors for Yukon firms and transportation costs from Smithers to Watson Lake provide a $35-$50/M fbm cost cushion for Watson Lake producers, while Whitehorse operators have a $65-$80/M fbm cost cushion. This means that a Yukon sawmill can break even if it can put surface-dried lumber into the Whitehorse market for $280/M fbm or less.

The product mix demanded by the consumer is also an important factor for Yukon firms. Standard kiln-dried dimensional products are the most sought after product by consumers. However, these products are manufactured in huge volumes at interior B.C. mills that face the low unit costs. Competition is very strong in this product line, there is very little product differentiation from one company to another and the long-term price trend for these products

TABLE 18. Hauling distance, comparisons between regions (km) 1986/87

Firm size	Sask	Manitoba	Alberta	Yukon
<100M	na	na	22.40	5.00
100M–1MM	35.30	27.00	52.80	23.00
>1MM	99.60	100.00	78.40	42.00

Source: Yukon Forest Industry Survey 1987, Giles et al. 1986 a and b

has been steadily declining over the past fifteen years (Figure 11). Moreover, as Figure 11 shows, the product prices are volatile, being subject to substantial price variations from year to year.

The Whitehorse wholesale price for standard dimensional lumber in June, 1987 ranged from $280/M fbm for 2x4s to $320/M fbm for 2x10s and the average price overall for these products was just under $290/M fbm. As Table 19 demonstrates, a Yukon firm that paid the federal sales tax and had average hauling costs of $38.75, would end up breaking even or losing a few dollars on each sale. For small firms, the small production levels and volatile price fluctuations require owners to achieve a much larger gross margin (30–40%) on each sale in order to make a fair return on their investments. The competitive risk is high for small Yukon firms selling standard dimensional lumber products and there is little financial incentive in the local market.

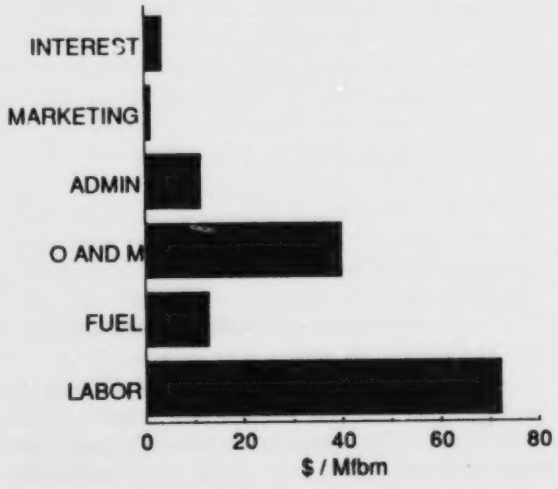

Figure 10. Sawmill production costs in the Yukon

On the other hand, a large firm such as Hyland Forest Products is in a better position to compete for the dimensional lumber market. Hyland Forest Products expected to reduce costs and compete in the dimensional lumber market by the end of 1987. If total costs fob Whitehorse were reduced by $40/M fbm or to around $255/M fbm, and production levels of 15-20 MM fbm per annum can be maintained,the firm seemed to be profitable. The business would make low per unit returns grossing only about 15%/M fbm sold, but overall profits could be $500 000-$750 000/yr. This would provide a reasonable return on its investment to the owners.

Green and rough sawn lumber is a substantially different product in the market place. The large southern firms do not manufacture these products as their processes are not geared to meeting this type of consumer demand. Moreover, green and rough lumber tends to weigh more and is subject to higher transportation costs, thus increasing the transportation tariff. And there is limited competition in every region of western Canada and the Yukon for these products. The result is a smaller, but a more stable market for rough and green lumber in the Yukon.

The Yukon sawmills sold rough timbers directly to the consumer for an average of $329/M fbm in 1986/87, while green planed material averaged $360/M fbm. The wholesale price for rough timbers in June, 1987 ranged from $310–$330/M fbm and averaged $317/M fbm while green lumber averaged $265/M fbm.

No federal sales tax is paid on timbers and the transportation costs would be less than that outlined in Table 19, indicating that the average Yukon sawmill could make a gross return of approximately $92/M fbm on timber sold directly to consumers and a similar or only slightly lower return if sold to the wholesaler. On green lumber sold directly to the consumer the gross return is $109/M fbm while they only receive $29/M fbm from the wholesaler at the mill gate.

Smaller firms clearly can make a reasonable gross margin on the sale of rough and green materials as long as they can meet their income targets. However, the markets

TABLE 19. Costs and revenue for sawn lumber manufacture in the Yukon 1986/87

Activity	Revenue (Lumber)	Revenue (Timber)	Cost	Range
A. Selling Price	360.00	329.00		250–400
B. Logging				
Fall, limb and top			21.74	
Skid to landing			19.09	
Load			4.66	
Haul to mill			15.51	
Administration			14.61	
Total logging			96.39	75–112
C. Milling				
Labour			72.37	
Electricity and fuel			12.74	
Operation and maintenance			39.78	
Administration			11.28	
Marketing			1.04	
Interest			3.48	
Total Sawing			140.69	116–170
E. Total	360.00	329.00	237.08	
F. Federal sales tax (8%)*	18.97	0.00	0–20	
G. Revenue less sales tax	341.03	329.00	237.08	
H. Net Revenue (FOB mill)	103.95	92.00		
I. Transportation (mill–customer)			38.75	0–54
J. Net revenue (Customer) (Before taxes and depreciation)	65.20	53.45		

Source: Yukon Forest Industry Survey, 1987.

Note: federal tax is paid on dimensional lumber; but not timber

are too small and too localized for the small firms to be able to effect improved efficiencies from larger scale production or to obtain the financial incentive to reinvest in newer equipment to accommodate the larger market segments. A conundrum exists in that "for the small operator the market in timbers is profitable but too small while the market in dimensional lumber is large but unprofitable." Smaller firms will need to find new markets and new products if they wish to increase capacity utilization, and they will likely require increased government assistance to allow them to convert to newer technology to accomplish the task.

Direct sales to consumers has been another key for the Yukon sawn lumber manufacturer, especially the smaller firms. The manufacturer who sells to the consumer tended to obtain prices for the sawn lumber that were significantly higher than that which could be obtained in the wholesale market from distributors. As well, Yukon consumers tended to obtain prices that were 10-15% below the retail costs of the lumber.

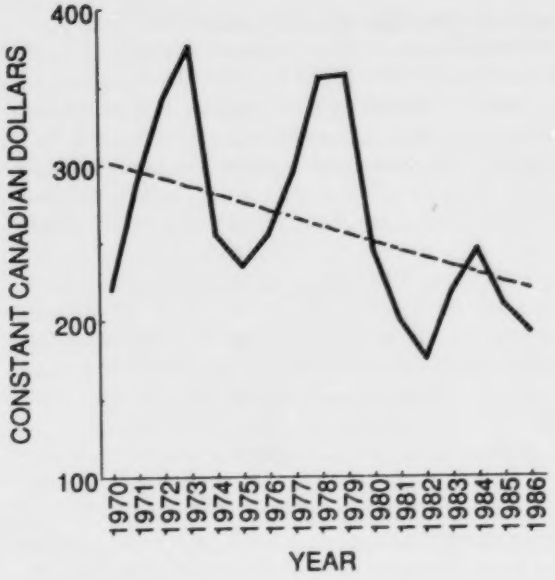

Figure 11. History of SPF (FOB mill) prices in the interior of B.C.

For mining or minor construction projects, these products provided a preferred alternative. Moreover, the most profitable small forestry businesses visited during this study, both in Alaska and Yukon, were integrated from logging all the way to full retail lumber/hardware distribution. Yukon sawn lumber manufacturers who wish to establish full-time businesses should seriously consider having a fully integrated forest business.

Finally, for the small operator there is one segment of the market exists that can provide enhanced profit, despite higher operating costs. Home siding, paneling, and specialty products such as fingerjointed shelving, moldings, and doorjambs bring in revenues of $650–$800/M fbm while production costs, even assuming high financing costs, are likely not to exceed $500/M fbm. This amounts to a gross return of up to $300/M fbm in a market segment that is relatively price stable. The market locally is not large for these products, but sufficient markets in Alaska and offshore are potentially available to aggressive firms (Heartwell 1987).

Small operators who wish to expand their operations would be wise to consider producing specialty products as a means of complementing their rough lumber trade. Again, the more profitable sawn lumber producers visited during this study were heavily involved in producing specialty products. Northwood Lumber in Fairbanks, Alaska was a clear example of a company that based its success on integration and sales of a broad range of standard and specialty products. In fact, the owners credited their recent survival to the revenues that came from the specialty products rather than the standard construction materials.

4.1.3 Fuelwood

Fuelwood production is a highly labour intensive business that requires limited capital equipment and has relatively low operating and maintenance costs. The only major piece of essential capital equipment is a truck used to haul the wood to market. In addition, several fuelwood operators and two sawn lumber manufacturers employ an automatic fuelwood sawing system to cut the fuelwood into stove lengths.

Table 20 shows that the total estimated operating costs for a standard fuelwood operation is $45.88 /cord, based on a five-cord capacity vehicle. Labour represents the major cost at $27.00 /cord, while delivery costs are $14.00 /cord and administration, operating, maintenance, and stumpage costs account for the remaining $4.88/cord . These production costs rise to $52.08 /cord for a 2.5 cord-capacity vehicle and to $64.93 /cord for a one-cord capacity vehicle. The costs rise largely as a result of the requirement for more time and effort to deliver the cordwood[43].

A cord of wood delivered and cut into 2' lengths sells for an average of $75/cord in Whitehorse[44]. On this basis a fuelwood operator can obtain a gross return of about $29.12/cord or 38.8% of the selling price. A markup of this amount will bring a reasonable gross return to firms in Whitehorse engaged in commercial fuelwood production. The markup appears to be sufficiently healthy, in fact, that it attracted at least 10 new firms into the market in the 1986/87 operating year[45].

Yukon's fuelwood producers also appear to be very competitive relative to other northern regions. Table 21 also provides an indication of the estimated production costs for cutting fuelwood in the NWT, using information from a study by Manecon (1986). Total costs in the NWT for fuelwood were estimated to be $60.23/ cord with the extra costs of production largely due to higher wage levels and longer delivery distances.

4.1.4 Pine seed production

As with the fuelwood industry, the pine seed business is highly labour intensive and involves even fewer operating costs than fuelwood production. In addition to wages there are minor expenses for equipment and field accommodation. In total, it is estimated that it costs $28.18/hectolitre to harvest the cones, with $18.18/hectolitre for labour 64.5 (%) and $10.00/hectolitre for operation, maintenance, and administration (Table 21).

Cones were generally sold under contract to cone buyers for approximately $75/hectolitre but ranging between $65 and $83 per hectolitre in 1986/87, depending

TABLE 20. Comparison of fuelwood production in Yukon and the NWT, 1986

Component Costs	Yukon $/Cord	Yukon %	NWT $/Cord	NWT %
Labor	27.00	58.85	34.00	56.45
O and M	1.70	3.71	1.70	2.82
Stumpage	0.18	0.39	0.18	0.30
Administration	3.00	6.54	3.00	4.98
Delivery	14.00	30.51	21.35	35.45
Total	45.88	100.00	60.23	100.00
Revenue	75.00		78.38	
Gross RTN	29.12		18.15	

Source: Loeks 1986 – Yukon; Manecon, 1986 – NWT

upon the type of species and the buyer. This provided the pine cone contractor with a gross return of about $47/ hectolitre picked. This return is quite good but entry into the industry is protected as cones can only be picked from certified areas and are sold on a tied contract basis to seed buyers in British Columbia. Pickers provide only those amounts requested by their suppliers and other entrants are discouraged as they must obtain certification and obtain their own independent markets.

Comparative data on other regions was not available but it would appear from conversations with buyers that the production costs in the Yukon are equal to or less than that in northern British Columbia. Most certified areas in the Yukon in 1986/87 were relatively easy to access relative to southern areas, and picking could proceed with few problems.

4.1.5 Houselog production

Almost all roundlog firms hand craft natural log homes to meet individual clients specifications. Under these circumstances it proved too difficult to obtain reasonable production cost estimates as operators reported that costs differed tremendously depending upon the region of the Yukon in which the client wished the home to be built, the size of the home, the quality and size of the logs requested, and the transportation costs for log delivery.

Growth in the Yukon economy in 1987 led to a significant increase in the number of natural log homes built, but this sector continues to remain a very small component of the housing market. Owners indicate that the business is marginally profitable but there do not appear to be excessive profits, as there has been only limited entry and exits from the sector in recent years.

The market size is small but very stable and can provide a few operators a steady annual income. Moreover, it appears that the sector is reasonably resistant to the economic cycles, as most natural log firms continued to maintain steady production levels during the recent economic downturn, even when standard home construction firms were almost dormant.

4.2 Economic Efficiency

The pine seed and houselog sectors of the industry, throughout North America, continue to profitably utilize labour intensive, centuries-old harvesting technology. At present, there appears to be no serious operating or technical impediment for the cost efficient delivery of their services to specific and well established markets.

The fuelwood sector is also a fundamental labour intensive business that has been able to fully meet the consumer demand while operating very profitably using only basic technology. However, the fuelwood sector is highly competitive as well as profitable, and as labour costs rise with the growing Yukon economy there has been a slow movement towards newer automated fuelwood cutting technology. This increase in the capital-to-labour ratio is consistent with improvements in productivity and the continuation of an efficient industry.

Given that the houselog, pine seed, and fuelwood sectors appear to be reasonably efficient and are certainly competitive in the Yukon at the present time, a detailed analysis of these sectors is not undertaken in this study.

However, the sawn lumber manufacturing sector, and to a lesser extent the logging sector, appear to be less competitive than other regions and able to supply only a portion of the total demand for sawn lumber products, especially construction materials. Recent studies have indicated that the problems in these sectors stem from a combination of operating, technical, and product efficiency elements. In fact, in one study, the author commented "that unless the full tree and sawing potential was utilized, the (milling) industry cannot survive"[46].

Operating efficiency relates to firms ensuring that they are using their existing production facilities, labour and other elements in the most productive manner and producing the lowest-cost items with the available technology. Technical efficiency means that firms are using the most appropriate technology in order to produce the output that the consumer demands at the least possible cost. And product efficiency relates to ensuring that the firm produces quality products that will be purchased by the consumer, that have the highest "value added" possible, and that will make maximum use of each tree harvested.

4.2.1 Logging sector efficiency

4.2.1.1 Operating efficiency

Yukon logging firms utilize standard logging practices when harvesting smaller timber volumes. Harvesting is done in the winter with the logging areas being clear or selectively cut using conventional felling by power saw. The logs are delimbed by hand and skidded by rubber-tired skidders to landings, where they are bucked into lengths. The bucked logs are then loaded onto regular highway logging trucks by a rubber-tired loader and hauled to the mill. In some cases the logs can be felled, limbed, and skidded directly to the mill. The process is simple, labour intensive, and cost competitive for the smaller volumes of timber that are harvested.

In the logging sector, numerous factors such as terrain, distance to the mill, forest stand size, and forest composition affect the operators' costs. Table 17 confirms that Yukon logging firms have operating costs that are comparable with other regions and lower than those in neighboring Alberta and British Columbia.

Close proximity to the forest resource, lower wage costs, and lower stumpage fees are the major factors that keep costs competitive. Table 18 demonstrates that haul distances are shorter. Wage levels in the British Columbia and Alberta logging industry tend to be $584/week versus $406/week for the average Yukon worker and stumpage fees, as outlined earlier, are substantially less than other regions.

TABLE 21. Pine cone production costs in the Yukon, 1986/87

Component Costs	$/HL	$/Bushel
Labor	18.18	50.00
O and M	7.00	19.75
Administration	3.00	8.25
Total	28.18	78.00
Revenue	74.65	205.00
Gross return	46.82	127.00

Source: Yukon Forest Industry Survey, 1987
Note: Price ranged from $150–$200/Bu. depending upon the product sought and buyer. 1 bushel–2.75 hectolitres

Despite the fact that logging costs are reasonably competitive, there did seem to be some areas for cost-saving improvements, namely, increasing volumes hauled per trip and reducing access costs. Beaumont (1978) undertook a major study on small logging and milling operations and he found that logging costs tended to decrease substantially as the volume of logs skidded increased. Adjusted for 1986 dollars, the study showed that logging firms could reduce their costs by $1.00-$1.50/m^3 if they could skid volumes of 75 m^3/day with a skidder or skid more than 3000 m^3 (500 M fbm) in a 40-day logging season. Beaumont suggested that logging firms, especially small loggers, attempt to reduce the amount of time spent skidding and hauling logs by felling in advance of skidding, and thereby ensuring the equipment can be fully utilized during the logging process.

Access costs offer another opportunity to save. The better the access and the less costly the access, the lower the logging costs. Four Canadian provinces provide subsidies or stumpage rebates to assist forest companies to construct access roads. In the Yukon, the road infrastructure for forest operators is not well developed, but the Yukon Government has a Regional Resource Roads Program that can provide assistance of 50 to 100% of the road construction costs. Hyland Forest Products is the only forestry firm to have taken advantage of this program and other firms, to remain competitive, must seriously consider applying for support.

One other potential cost saving is in proper mainte-

nance and inventory control. The visits during the Yukon Forest Industry survey indicated that most of the logging equipment was maintained in good to excellent condition. As indicated in Section 3, most firms were engaged in logging to complement summer endeavors and were able to utilize their expensive capital equipment for a variety of tasks. This reduced per unit costs of the equipment and provided a clear financial incentive to place emphasis on equipment maintenance.

On the other hand, the survey also confirmed the conclusion of the Peschke (1986) report that many operators have not introduced maintenance recording systems and preventative maintenance plans in order to ensure that costs are minimized. On two occasions operators indicated that logging costs had risen sharply in 1986/87 because they had several long periods of downtime caused by failing to ensure that the equipment was maintained properly or that spare parts were in stock. The downtime added both to production costs and lost revenue for the firms. Any efforts to establish regular maintenance procedures will result in lower costs.

4.2.1.2. Technical efficiency

With respect to technical efficiency, it is clear that Yukon logging firms do not employ the latest in equipment technology. However, it also appears that Yukon firms employ logging technology that largely fits the type of logging undertaken. For lower production smaller-area harvesting, the traditional practices are still considered by the industry to be the best practices[47].

The beauty of the present small logging operations is that the skidders and loaders can be easily converted to other endeavors, the capital costs are quite reasonable, parts and service are easily available, and the equipment is versatile. As such, capital costs can be spread out over 180–200 operating days on a variety of jobs[48], and with greater utilization, the costs decline and the profits increase. Moreover, this form of logging is highly labour intensive and until wage rates rise significantly, it continues to be more profitable to use cheaper labour rather than more expensive mechanized equipment[49].

There is a variety of automated equipment that can be used for larger volume harvesting. Feller bunchers, delimbers, topper/bunchers, and all–in–one harvesters can efficiently cut, delimb, and load upwards of 100 trees per hour from 7 cm (3") to 80 cm (38"). However, these types of equipment tend to be most cost effective when harvesting larger volumes of trees (>10 MM fbm annually) and are not likely to be applicable in the Yukon where the average mill produces only about 250 M fbm of sawn lumber annually.

The capital costs of this equipment are high, in the range of $550 000 for an integrated logging operation, the equipment can harvest more trees in a day than is required by the average sawmill in a year, and the equipment is sometimes not easily converted to other uses such as construction or mining.

Hyland Forest Products represents one of the few firms that may have sufficient volume to justify the use of such equipment. As the firm begins to meet its production capabilities of 20 MM fbm /yr., a demand is created for sufficient log inventories to maintain a steady supply of product. Winter logging is the most cost effective method in the Yukon, but it requires the harvesting of 10–15 MM fbm during the short 90–100 day winter season to ensure the steady supply during the spring, summer, and fall production season.

To date, Hyland has been forced to meet part of its supply requirements through higher cost summer logging. In the future, it would likely be prudent for the firm to work with their contractors and use existing government programs to experiment with the use of more mechanized equipment to test the cost effectiveness of higher volume winter harvesting.

4.2.1.3 Product efficiency

Logging firms in the Yukon have historically shown very little interest in attempting to make complete use of trees harvested. The Territorial Lands Act has no provisions to encourage logging firms to utilize the wood waste in the forest and the markets for such waste have historically not existed in the Yukon. Many firms leave significant quantities of wood residue in the forest, where it must be piled and burned at a cost to logging firms. In fact, Peschke (1986) indicated that these costs could be as high as $8–$10/ton.

The logging sector had virtually no market for wood residue before the middle of 1987 and firms, therefore, had very little economic incentive to harvest this product. In the middle of 1987, three market areas opened up for residue. Klondike Central Heating Ltd. obtained a contract with the Yukon Government to supply hot water heat from a wood residue fueled heating system. This system will use approximately 4000 m3 (600 tonnes) of material annually. Yukon College will be burning 5000 m^3 (750 tonnes) of wood residue annually to heat the college facilities. And Hyland Forest Products has refurbished their wood-fueled steam generator that is expected to use the company's hog fuel to create the 1.2 megawatts required to run the mill.

The total open market in 1987, therefore, consisted of a modest 9000 m^3 of waste material, giving only limited encouragement to logging companies to utilize this wood waste. Feasibility studies on wood-fueled hot water systems are now being conducted in several Yukon communities and could provide new markets in future years totalling up to 16 M m^3 of wood residue. Even the expanded market provides only limited incentive for

logging firms to increase utilization.

Recent research in B.C. also tends to point to little future opportunity for Yukon logging firms to achieve greater product efficiency. A study by Nagle *et al* (1987) looked at ten different residue production systems in the B.C. logging industry and found that wood waste chippers located at a logging site would face production costs of more than $\$25/m^3$, while similar systems located at a sawmill yard could process materials for $\$10–\$12/m^3$, less than half the cost[50].

The study also concluded that "a hog chipper in the landing is unlikely to be economic at any probable value of hog fuel in B.C."[51]. Nagle suggested that in B.C. where there are established hog fuel markets, the costs of residue production in the bush was prohibitively high and should not be pursued for some time. If such systems are not feasible in British Columbia where large scale operations are the norm, they appear less likely to succeed amongst Yukon's small firms.

The one possible exception to this analysis could be for those logging firms contracting to Hyland Forest Products. Nagle *et al* (1987) also discovered that chipping costs declined dramatically as utilization increased, as shown in Figure 13. This means that larger operations such as Hyland Forest Products may find it profitable to use waste residues in the bush for their thermal generating plant. The company initiated a study in late 1987 to look at the feasibility of using this waste material.

At this time the prognosis for using waste from logging operations does not appear to be good, but care should be taken to constantly monitor the process over time.

4.2.2 Sawmill sector efficiency

Yukon firms had difficulty in 1987 producing dimensional lumber products as competitively as their competitors in northern B.C. (Table 20). However, Yukon firms are able to profitably supply the rough timber markets in the territory.

The efficiency concerns in the sawn lumber manufacturing sector, however, are distinctly different for Hyland Forest Products. Hyland Forest Products underwent a multi–million dollar refurbishing in 1987 in which the entire production processes were changed and the existing planing and drying systems rebuilt. As well, modifications and improvements where made to the heating plant in order to allow it to provide electrical power to the mill. It is difficult to predict at this time what impacts these investments will have on the cost of dimensional lumber, except that it should reduce those costs by $40–$50/M fbm. Discussion of Hyland Forest Products efficiency can only be done in very general terms. Instead, the study concentrates on the efficiency of the other twenty–four sawmills in the territory which operate with a technology that is almost a century old and utilize operating procedures that are decades old.

4.2.2.1 Operating efficiencies

During the visits to the various sawmills, it became clear that many of the firms suffered from internal operating inefficiencies arising from three basic areas, namely, unproductive capital equipment, poor equipment maintenance, and inefficient use of manpower. On the other hand, the research in this study indicates that the potential exists for smaller Yukon firms to make sufficient operating improvements to begin to compete for the dimensional lumber market.

Beaumont (1978) in a major study in the interior of B.C. concluded after surveying over 74 small sawmill operations that a small mill could efficiently process sawn lumber. He found that the "efficient small scale milling operation" is an integrated logging, sawmilling, planing, and retail business.

The optimal process consists of 40 days of logging, followed by 66 days of sawing, and three to four weeks for selling the lumber products produced. The efficient mill is one that produces 12 M fbm /8 hr. shift for the 66 operating days and produces a total of 800 M fbm for each season.

The viability of this process lies in the use of the same capital equipment and labour in both operations. The optimum mill is operated by four men, with the owner and his three employees being involved in all phases of the process. The four staff fall and skid a three-month log inventory to the mill site, then the same personnel take on the various sawing functions and reduce that log inventory to lumber over the next period. The skidding equipment usually doubles as a loader to feed logs into the plant, and moves and stacks the sawn lumber. Finally, the owner, and possibly a helper or two, deliver the sawn lumber directly to the consumer, usually using the same logging trucks used to haul the logs. This sequencing makes maximum use of the labour and auxiliary capital equipment, without unduly compromising the operating capacity of the mill.

Using the model Beaumont designed to determine the efficient operating costs for such a mill, it was found that an efficiently-sized Yukon mill, located within 5 km of its wood supply, should face logging costs of $60–65/M fbm and should mill rough lumber for a cost ranging from $80–85/M fbm. Planing the material would add another $25–30/M fbm. Including wood costs, the efficient mill would produce rough timbers for $135–140/M fbm and green planed lumber for $165–180/M fbm[52].

This production cost is at least $55/M fbm less than the average Yukon firm was able to produce a similar product in 1986/87. While the estimates created by the Beaumont model are undoubtedly optimistic, since they

assume a continuous and smooth flow of product for the full 66 days of operation, it still indicates that Yukon operators may be able to obtain significant cost savings in their operations.

As indicated earlier, the inability of Yukon firms to produce material at a reasonable operating capacity adds to the operating costs. Yukon mills are operating at only 15% or less of their engineered capacity and in most cases they operate for only 33 days per year or half the time recommended by Beaumont in his research. Operations and maintenance costs must, therefore, be spread over a smaller volume of output and there are invariably higher labour costs associated with start up and shut down on a sporadic mill schedule than one that produces continuously.

Sawing time using a circular saw to process dimensional lumber was another operating disadvantage. The circular headsaw is primarily used in southern mills for the "primary breakdown", where logs are turned into cants as part of an in-line production process. These saws are quite effective for that purpose.

However, for "secondary breakdown", where the cants are sawn into dimensional lumber, timber cut on a circular saw must be passed through the saw several times. Most mill operators who were interviewed indicated that depending on the log size and lumber dimensions, it took 2–5 times longer to cut dimensional lumber than it took to produce standard mine timbers using a circular saw. This extra sawing time increased the labor and maintenance costs, with only limited increase in the value of the sawn material. Small mills cannot produce dimensional lumber on a viable basis until they obtain a gang resaw or edger system that allows the lumber to be cut from a cant with a single pass.

Equipment maintenance and downtime were additional problems quoted by operators as contributing to higher costs. One significant advantage of the existing small-scale operation is that the technology is constant, providing the opportunity for an owner to construct and maintain an operable sawmill from a large selection of used machinery.

In order to maintain this advantage, however, firms must endeavor to keep their equipment in top condition. A major concern in many mills was the deteriorating state of the equipment. Twenty percent of the mills used a timber frame structure or stationed the mill on a wood base. These timbers were often deteriorating from age, causing the mill or associate equipment to be misaligned and produce inaccurate cuts or to cause the carriage to come off its tracks more easily.

The majority of the equipment was exposed to the elements as well, resulting in accelerated deterioration of moving parts and hydraulic systems. In some mills, the operators used only crudely painted dials on the setworks reducing accuracy. Several mills had badly worn equipment such as log dogs, carriage wheels, and loose saw teeth, affecting accuracy and cost.

Many mills did not seem to have any form of maintenance records or preventative maintenance schemes, which likely contributed to equipment problems and added to downtime during production. Operators indicated that maintenance problems halted production from 15–30% of the time. During these periods staff would have to be paid while repairs were underway. If a firm loses only 5 days on a 40-day season, it costs the firm upward of $1400 for a four person crew or $5.75/M fbm on 250 M fbm of production.

Finally, the inefficient use of staff could cause operating costs to rise quickly. Labor costs rise during downtime, when staff are idle. Costs also rise in cases where a poor mill layout tend to promote a great deal of extra handling of logs and finished lumber.

With respect to the operating efficiencies of Hyland Forest Products, it can only be stated that in September, 1987, the firm was producing lumber using a standard circular headrig and neither the kiln or the power plant were operating. At that time, the manager indicated that the firm faced log costs of $17.60/m^3 ($100/M fbm) and was producing lumber at costs above the $165/M fbm estimated in the Deloitte, Haskins and Sells report, for a total cost of more than $265/M fbm.

At those costs, the firm was not cost competitive with southern producers and could not continue in the operation. However, the new milling equipment became fully operational in late 1987, as did the kiln and power plant, which according to Deloitte, Haskins and Sells should reduce costs to a more competitive level of around $220–230/M fbm.

Peschke (1986) made several good suggestions to assist operators to improve operating procedures in order to reduce costs and improve productivity, which are as follows:

1. initiate a log scaling system in order to know exactly how much product was on hand;

2. establish a comprehensive maintenance program that includes regular preventative maintenance and a record keeping system, complete with log books to record downtime and parts repaired;

3. maintain a good shop and a full range of the required tools and ensure that an adequate inventory of the most often replaced and hardest to obtain parts;

4. organize the mill site in order to reduce the need to handle the tree from log to final product; and

5. undertake training in business and financial management in order to maintain strong control over operating costs.

4.2.2.2 Technical efficiency

The failure of the Yukon sawn lumber manufacturing sector to acquire new milling technology is seen by many officials and researchers as a serious constraint to improved viability of the sector. After reviewing the sector, it would appear that selective technological improvements could enhance productivity and profitability, but the market appears to be too small to support the further installation of costly equipment.

With the exception of Hyland Forest Products, the processing technology of the Yukon is as old as the territory itself and is for the most part rudimentary. The standard milling equipment for Yukon mills consists of a 48–52" circular headsaw combined with a 3/8"–5/8" kerf sawblade and a 12–15 ft movable log carriage. The carriage and its tracks mounted on a wooden or steel frame and the mill is powered by a 250–440 horsepower diesel generator. Some firms used hydraulic systems to operate the carriage but most used cable systems.

Of the sixteen smaller mills that operated in 1986/87, eleven used the circular saw for both primary and secondary breakdown of the logs (53). Four firms had edgers to undertake the secondary breakdown from cants into dimensional lumber and two firms used double arbour gang resaw equipment for secondary breakdown. There was one firm with a portable single band saw for producing both cants and dimensional lumber products.

These smaller mills use hand–fed systems, manually operated and employ no debarking, chipping, or waste burning facilities. Less than half of the firms plane their production and only one firm actually planes all its output.

The large new Hyland Forest Products mill, on the other hand, will incorporate many newer production techniques. The new mill will utilize new multi–saw primary breakdown equipment in combination with multi–saw edgers for secondary breakdown and trim saws to ensure uniform product length. The saws will utilize blades with a narrow kerf of 1/8" or less to maximize lumber recovery and a semi–automated stacking system will be implemented. As well, the product will be planed and dried before shipment to customers.

Popular belief may be that a distinct two-tiered size structure for the sawn lumber sector would be technically inefficient, but the contrary appears to be the case. Several studies in the last fifteen years on the optimal sawmill size have unanimously concluded that the very small, producing 12 M fbm/hr shift in a 66–70 day season and very large firms, producing 100 M–119 M fbm/8hr shift in a 200 day season can both be technically efficient[54].

Firms with higher production levels included a combination of 100 M fbm mills in one location, each producing lumber from logs of distinct size categories. Firms in the middle range were rapidly being eliminated as the firms either modified their technology, and expanded production, or left the industry.

Ondro and Williamson (1984 and 1985), Bohning (1986) and Giles *et al* (1986 a and b) demonstrated this trend across the Prairies by showing that the numbers of smaller firms entering the forest business rose rapidly in the last 15 years, while there was a simultaneous increase in the percentage of production held by those firms producing over 20 MM fbm annually.

The reasons postulated for this movement to two sizes of firms, lies in the complementary types of products sold and technology used. Again, Beaumont (1978), Ondro and Williamson (1984) and Giles *et al* (1986 a and b) demonstrate that smaller firms survive because they produce a rough product for use in small local markets, while large firms produce a standard kiln-dried dimensional lumber product for world-wide distribution. The large firms do not have the time or facilities to accommodate the small local market, while the small mills do not have the size of plant to accommodate world markets. These mills produce complementary products, not competing products.

The other factor depends simultaneously on the simplicity of the technology on one hand, and the complexity of the technology on the other hand. On the one hand, the smaller firms survive and thrive because of a simple integrated technology. And on the other hand, the larger operator succeeds because of advanced specialization and large-scale production processes.

The success of the small operator, producing less than 1 MM fbm annually lies in the integrated operation, with the owner being involved in logging the wood, sawing it into products, and selling directly to the customer rather than going through a wholesale outlet. The owner/operator controls the production process from start to finish, choosing the appropriate trees, hauling them to the yard, inspecting each log closely, with few time constraints, to determine proper cuts, producing from each log the maximum volume obtainable from his equipment and selling directly to the customer. This process reduces waste, improves the quantity and variety of products recovered, and, if done properly, will result in profits equal to that of larger operations.

In fact, Beaumont (1978) stated in his concluding remarks that for smaller firms "the separation of logging, sawmilling and product sale, would appear to contribute to diseconomies of scale (i.e., higher operating costs)". Success for the small operator according to Beaumont lies in less, not more, specialization.

On the other hand, the research found that very large firms, of the Hyland Forest Products variety, achieve efficient operating levels through dramatically increased specialization, the use of highly automated and capital intensive production processes, and the installation of modern equipment using the latest technology.

The large plants maintain low unit costs by using automated production processes that move large volumes of material through a plant using relatively few employees. These mills use high speed, thin kerf saws that get the greatest amount of lumber out of each log, obtain lower administration and management costs through large scale organizations, and develop extensive advertising and distribution networks at very low cost per unit of production. Moreover, these mills pay lower costs for their wood as they purchase the large volume of logs required to allow logging contractors to justify the purchasing of modern logging and hauling equipment.

While the Hyland Forest Products mill is not likely to be able to institute all the modern technology immediately, it has moved to implement substantial technological changes that will improve productivity and reduce costs. The firm is moving to an in-line process with multi–saw systems that automatically breakdown logs into basic components, followed by single and multi–saw edgers that turn the basic components into dimensional lumber products. Now one pass of a log through this in-line system is all that is required, as opposed to the old time-consuming process of sawing slabs off individually on a single circular headsaw. In this process quality is dramatically improved, product recovery is enhanced, labour costs/unit of output are reduced, and much larger volumes of logs can be processed per shift.

Sawmills in the intermediate range between 12 M and 100 Mfbm/shift are declining across western Canada as they tend to face increasing capital costs, without attendant improvements in productivity and declines in labour costs. To increase the plant capacity beyond 12 M fbm per 8 hr. shift requires such technical improvements as faster carriage loading and feed rates, twin or gang saw initial breakdown, and in-line edging. The increased throughput must be matched by faster log delivery and lumber removal, requiring increased mechanization and labour in all phases from logging to lumber delivery. Generally, expansion of a small plant to an intermediate plant of a capacity of up to 40 M fbm per shift or 5 MM fbm per yr. requires greater capitalization with no proportionate reduction in labour cost. Moreover, the labour must be more highly skilled to operate the new equipment.

Yukon firms wishing to expand output into this production range would find themselves saddled with additional capital costs and attendant financing charges, similar labour costs, and a limited market for rough or air-dried lumber products. Revenue possibilities are fixed while costs are higher and in this situation, a firm is subjected to significant risk of failure. The results of this study would suggest that Yukon firms continue to maintain production at levels of either 800 M–1 MM fbm per yr. or 20 MM fbm per yr, but not consider establishing intermediate-sized plants.

This is not to say that smaller mills should not consider investing in new technology. Yukon's smaller mills can presently use their basic circular saws to profitably cut rough timbers, but the markets for timbers and houselogs are limited and insufficient to allow the smaller firms to efficiently use their capital equipment. On the other hand, the small mills do not have the capital equipment to effectively cut basic dimensional lumber products or specialty products, that constitute the bulk of the market demand. New sawmills that combine circular saws and edgers or gang resaws are being produced by several companies including Brunette Machine Works Ltd., Exco Industries Ltd., Reliable Machining and Fabricating Ltd., and Morbark Ltd. in B.C., Cardinal Sawmill Equipment Inc. in Quebec, Enercraft Mfg. in Ontario, and Almac Equipment Ltd. in Alberta. The basic mills can run from $43 000 to $65 000 with an additional $20 000 for power and assorted equipment such as blades and feed decks.

There are also a few important capital improvements that could be implemented in the existing sawmill equipment today, primarily to improve lumber recovery, reduce target size, and increase cutting efficiency. Most Yukon firms have no market for the sawdust, slabs, and other waste material coming from their mill. As a result, any wood lost in the production process means that the firm must incur costs to harvest more trees per unit of output and to dispose of the waste, obtaining less potential revenue per unit of logs cut.

For Yukon mills, improving lumber recovery is extremely important, as it allows mills to increase the amount of lumber coming out of each log, while reducing the amount of sawdust and other waste products[55]. Saw thickness is a major determinant of the lumber recovery factor (L.R.F.) because the width of the saw or kerf is lost to waste when the log is sawn into lumber[56]. To illustrate this point, assume that a mill which processes 2000 logs / season, reduces the kerf on its circular saw blade from 0.375 inches (3/8") to 0.1875 inches (3/16"). If each log is sixteen feet in length, the reduction in the kerf would generate an additional 6000 board feet of lumber, worth approximately $2000[57]. The capital cost of purchasing a thinner circular saw blade and the appropriate guide system are set a $2000–$3000, suggesting that the capital costs could be recovered in one, or at most, two years.

Another important improvement would be the implementation of quality control methods and possibly the purchase of new setworks to control target size and cutting efficiency[58]. For rough finished products, the target size would be the total of the final product dimensions, plus shrinkage and sawing variation allowances. The target sizes for standard 2x4 dimensional lumber should not exceed 1.875 inches, but many smaller Yukon firms have target sizes that are 1.94" to more than 2".

By reducing and controlling target sizes, more lumber

can be obtained from each log, and on larger logs it is possible to get one more cut line or lumber piece. Forintek studies have shown that reducing target sizes by only 0.0625 inches (1/16") can improve lumber recovery by 2-4%. For a mill cutting 1 MM fbm per yr a two percent increase would give it another 20 000 fbm of lumber and an additional $6000 in revenue.

The easiest means to improve target size is for owners and sawyers to under-go training in improved sawing techniques. Forintek and others provide such courses. In addition, firms can purchase a variety of low cost capital equipment which improves the holding capability of the log carriage and hydraulically turns the logs rather than turning them by hand.

In addition, firms can purchase somewhat more expensive equipment such as double arbour gang resaw equipment or newer edgers that automatically cuts cants or slabs into the proper dimensions. Finger jointing equipment, more efficient planers, and other specialty items can also be purchased for firms wishing to increase the variety of their products.

Yukon firms have tended to build their mills to be stationary rather than portable, reducing the flexibility of their equipment and potentially increasing their costs. A portable mill can be moved right into the timber supply and waste material can be disposed of at that site rather than being transported to the mill. Since 30-40% of each log is presently being turned to waste it means that up to $7/m^3$ or ($30 M fbm equivalent) is being spent at the average mill to move waste material to the mill. If Yukon firms could return their mills to a portable status, in many cases they could reduce costs and increase output. Other associated expenses would be to convert the wooden frames and other materials to steel frames and purchase new parts to replace worn or partially worn materials on a regular basis.

Peschke (1986) commented on several relatively inexpensive new small mills and equipment such as gang resaws and edgers that can substantially improve product recovery and enhance product variety and quality. Forintek maintains a library containing files listing alternative sawmill equipment available and they provide a program to assist firms to improve their equipment and operating procedures. The Woodland Workbook, published by the University of Oregon also devotes an entire book to acquiring and using small mills[59].

Government financial assistance would likely be required for this equipment as most firms would not be able to sustain a viable business without this assistance, but could also not expand their markets without it. The Yukon government has financial assistance for such acquisitions through its loans program and through the Canada/Yukon Small Business Subsidiary Agreement. As well, certain firms should consider applying to the Canada/Yukon Renewable Resources subsidiary agreement in order to test out some of the newer technology such as thinner kerf saws and new sawmills.

Section 5 identifies several opportunities for sawn lumber manufacturers to improve revenues, with expanded sales of dried lumber being the largest market segment. Peschke (1986) raised the possibility of developing a community dry kiln for use by operators[60]. A dry kiln would provide a means for smaller mills to expand their productive capability without having to absorb the full costs of the new investment.

Several factors appear to preclude the development of such facilities in the Yukon in the immediate term. First, recent research by Woodland Resources Consulting for an NWT firm concluded that the installation of a high technology, lower cost dehumidifying kiln system in Hay River was only marginally viable, even with production levels approaching 4.8 MM fbm /yr and a 50% government grant for the capital equipment[61]. For a Yukon system, there would be additional logistical problems such as transportation costs to move the product to the community kiln, possibly making the project unviable.

Second, the equipment used by most forest operators can produce competitively priced timbers but the circular headsaws are not effective at producing quality dimensional products. As such the installation of a kiln at this time may be premature. The attention by the industry should be on improving the quality of their equipment in order to produce better quality green dimensional lumber products.

Third, the costs of installing new capital equipment to increase production and product quality may, according to studies cited earlier, result in increasing financing costs without attendant decreases in operating costs, resulting in firms being less, not more, competitive[62].

On the surface it appears that there is an untenable problem here. However, the key to the survival of the small firm in Yukon lies, not in attempting to compete with large firms in the production of standard dimensional products, but to improve and modify their capital equipment so they can produce a variety of higher value products to meet specific product demand within specialized market segments.

Moreover, a small firm which produces good quality lumber may be able to remain competitive by supplying air-dried lumber. Northwood Lumber Co. of Fairbanks is a small firm producing less than 3 MM fbm annually and it has been successful in producing and selling air-dried lumber in the local community in direct competition with southern firms. The success of the firm has resulted from a strategy to ensure high levels of maintenance, to ensure that the greatest lumber recovery is obtained, to ensure that the dimensional lumber is of good quality and properly graded, and to find markets for

TABLE 22. Production cost comparisons in various regions, 1986/87

Component	Regions		
	NWT	Yukon	B.C.
	($/M fbm)		
Wood costs			
Gross	97.37	96.39	118.46
Residue (minus)	0.00	0.00	25.00
Net	97.37	96.39	93.46
Milling	125.00	140.69	100.00
Drying	8.05	8.05	4.00
FOB Mill	230.42	245.08	197.46

Source: Forest Industry Survey 1987 (Yukon) Price Waterhouse 1986 (B.C.) Ference 1987 (NWT)

Note: The BC information is for Ft. Nelson, B.C. mills. The NWT information is based upon a mill at Hay River, NWT.

the waste product.

Finally, Yukoners today are demanding kiln-dried products for uses that do not require kiln drying. Fencing, decks, certain home renovations, utility buildings, and other similar projects can be constructed with rough air-dried materials. There is a need to convince consumers to purchase these rough products and an essential element in that strategy is to be a part of a formal lumber inspection system and to develop a marketing strategy that educates consumers on the advantages of rough lumber in terms of strength and aesthetic characteristics.

This means that in any forest development strategy Yukon firms should work hard to remain competitive at producing rough timbers and cants, should begin investigating their capability to produce high value products like siding, flooring, and paneling for the home construction industry, should develop markets for their wood residues, and should investigate the purchase of remanufacturing equipment such as finger jointers for use in making various types of millworks stock for window frames, furniture, and shelving. Research into the development of other rough lumber products that can substitute for finished products in home construction should also be explored. Finally, there is a need for smaller firms to attempt to make inroads into the 80% of the dimensional lumber market through effective marketing and new research and development.

4.2.2.3 Product efficiency

Product inefficiency, or the failure to utilize 100% of each tree harvested, has been considered a major constraint to Yukon's sawn lumber manufacturers. Many authors, starting in the late fifties, have criticized the fact that Yukon firms utilize less than 60% of each tree and have called on industry to make greater efforts to increase the resource use.

Firms in regions in a more mature phase of development, such as the interior of B.C., can effectively utilize more than 95% of each tree. An interior B.C. mill will produce approximately 600 pounds of green lumber, 300 pounds of chips and 100 pounds of hog fuel from each 1000 pounds of logs run through the mill. If the mill has a co-generation facility it burns the hog fuel to produce electricity for the plant and heat for the kilns, and if not, it sells the fuel to another firm such as a pulp and paper plant for their use. Wood chips are sold to pulp mills or exported, while logs that are uneconomic to saw are exported directly offshore to foreign markets.

In addition to obtaining the full value from each tree harvested, these firms are more flexible in their product mix. These firms can chip marginal side boards if chip markets are healthy or produce specialty products such as bed frames, fencing, and pallet stock if chip markets are poor.

Table 22 shows that wood costs to B.C. mills decline significantly once the revenue from wood residue

is included. As well, the flexibility of the product mix can often allow mills to continue to meet operating costs even with lower market prices. In fact, several interior B.C. firms were interviewed during the course of this research and all the firms felt that the by-products of their operations represented the real profits of the firm.

In the Yukon, the opportunity to utilize wood residue and to increase wood use in 1986/87 was poor. Most firms simply buried or burned the waste from their milling operations, and only three firms were able to sell a portion of their wood residues. These firms sold roughly 400 cords of slabs to customers for fuelwood and in one case sawdust was sold as animal bedding to a local hobby rancher. These firms sold their material from $20–75/cord and generated an additional $10 000-$15 000 in revenue.

The sawmill operator has a good opportunity to be competitive in the production and sale of wood residues to the new markets that are developing. Nagle et al (1987) reported that hog fuel systems in mill yards can produce wood residue fuel for between $10 and $12/m^3. This is about half the costs for a logging-based hog fuel system and marginally lower than the production costs of solid fuelwood, estimated to cost about $33.65/cord[63]. These costs illustrate that the sawn lumber manufacturers can be competitive with fuelwood operators in supplying materials to heating systems such as that at the Yukon College or Klondike Central Heating.

Other markets exist for wood residues including animal bedding, landscaping materials, and flooring cover for mopping up oil and dirt on industrial floors. A recent marketing study (Heartwell 1987) outlines the advantages of these products in more detail and discusses the success being experience by Northwoods Lumber Co. of Fairbanks Alaska in marketing these items. Firms in Yukon have not moved into this area and should be encouraged to do so as a further means of making full use of their harvest.

5.0 MARKET DEVELOPMENT OPPORTUNITIES IN THE FOREST INDUSTRY

In a previous report on Markets for Yukon Forest Products (Heartwell 1987), a detailed discussion was provided on the market opportunities for products produced by the Yukon forest industry. While there is no need to repeat the entire text here, it does seem appropriate to provide a short summary of the opportunities as they pertain to the forest industry.

The local Yukon market provides a major opportunity for Yukon forest companies, in all sectors except the pine cone sector. Solid fuelwood operators met the complete needs of the domestic heating market in 1987, but only penetrated a small portion of the industrial heating sector. While future increases over the present production levels is not anticipated in the domestic fuelwood market, there is a potential market for 112 000 cords of wood in the industrial heating market.

The industrial heating market is likely to be accommodated through the use of wood fueled central hot water heating systems providing expanded opportunities for commercial fuelwood suppliers, and opening new markets for the sale of wood residues. Klondike Central Heating Co. is building the first such commercial system in the Yukon. It will create a demand for 4000 m^3 (600 tonnes) of material each year. The new Yukon College has the capacity to utilize a further 5000 m^3 of wood and at least two other wood-based systems may come on stream in two other Yukon communities. This would provide a potential demand for up to 17 000 m^3 of wood residue in the near future.

Hyland Forest Products refurbished the electrical power plant at its Watson Lake millsite and can expect to cover their 1.2 megawatt power requirements from residue material at a savings of $200 000–250 000 per year, or the equivalent of $12.96–13.34/M fbm[64].

The local market for dimensional lumber is also excellent. The total demand for all SPF product in 1986/87 was approximately 14.9 MM fbm, with the demand for kiln-dried lumber amounting to about 12.5 MM fbm or 84% of the market. Yukon producers supplied only about 600 M fbm of this market segment, leaving almost 11.92 MM fbm to be imported from B.C. The remaining 2.4 MM fbm in rough timbers and milled houselogs (20%) were supplied by the local forest operators. The immediate priority is to substitute the 11.9 MM fbm in B.C. lumber with Yukon products.

Hyland Forest Products is the most likely firm to penetrate the dimensional lumber market as they are the only facility with the capacity and kiln facilities to meet the demand. However, there is room for more air-dried lumber products and specialty goods, especially those for cosmetic home improvement such as siding, decks, and paneling.

Opportunities in the houselog and pine seed sectors are limited at present. These sectors are very stable components of the industry but have traditionally directed their efforts to small specialized markets.

Export markets are available to all sectors of Yukon's forest industry. Commercial fuelwood operators have the potential to expand operations into the Alaska Panhandle, particularly Skagway and Juneau, and into the Seattle markets. Logging firms have the potential to export logs as part of a co-ordinated program to sell logs and specialty products to Pacific Rim countries.

Sawn lumber manufacturers have opportunities to annually sell upwards of 40 MM fbm in sawn lumber products in the immediate regions of interior Alaska and the Mackenzie Delta. Mackenzie Delta demand is driven by oil and gas exploration in the Beaufort Sea, while the lack of timber supply in the interior of Alaska opens markets for Yukon products there. Yukon firms will be most competitive in the sale of kiln-dried dimensional products to the Delta and interior Alaska, but smaller firms can supply rough timbers, milled logs, and specialty products to these regions.

Pacific Rim markets are available, especially Korea and China, and they offer significant opportunities for further development. Yukon firms are not likely to be competitive in standard dimensional products and should concentrate on supplying specialty dimensions, like Japanese baby squares or interior design beams and specialty products like siding, interior finishing materials, joinery materials, and laminated board products. Success in the Pacific Rim markets will be achieved, however, only if there is a joint policy of log and lumber sales, and if there is an advanced marketing strategy that focuses on personal contacts.

The United Kingdom provides an excellent export market for the full range of dimensional products and specialty goods. Hyland Forest Products has made initial sales to the country and further sales are pending. The specialty forest products markets, especially for joinery materials such as window casing and moulding stock, are very strong. Also, high quality pine products, such as those produced in Yukon, are in heavy demand by consumers. Other European countries are harder to penetrate and Yukon operators would be advised to concentrate on developing the United Kingdom before going to the continent.

While a pulp mill in Yukon is not considered feasible at present, there appears to be a good potential for offshore sales of pulp chips. Expanded production in British Columbia combined with international shipping access and high quality spruce chips in the territory, makes Yukon a good prospect for chip exports.

Makin Pulp and Paper Co. has indicated that they are interested in harvesting wood chips from the Yukon as feedstock into their $250 million pulp and paper operation at Britannia Beach. The firm will require 125 000 m^3 of product each year if the project proceeds.

As well, there appears to be increased potential for sale of chips to Korea and Japan. The key to chip exports will depend upon being able to negotiate a deal to utilize excess capacity on the Curragh Resources ships.

Log home exports are possible but there are significant obstacles impeding any significant growth in this sector. Pine seed exports are also expected to remain steady, however, sales are not expected to expand for some time. Sweden is decreasing its demand for seed but demand in Norway and Denmark is replacing lost sales. Marketing in Europe should be undertaken in order to ensure that the market is continued.

A wood preservation facility is considered feasible in the Territory if the White Pass railway is reopened and significant enforcement of the Yukon Pounds Act is undertaken. And finally, some demand exists for very special products like animal bedding, bark mulch, and industrial clean-up materials using forest residue.

6.0 IMPEDIMENTS TO FUTURE DEVELOPMENT

During the public consultation process for the Yukon 2000 Economic Development Strategy, and previous research by Peschke, in 1986, there has been concern expressed by forest operators about impediments that threatened the viability of the forest industry in the Yukon. During the research for this report, comments were solicited from every person interviewed as to what, if any, impediments there were to the further development of the forest industry in Yukon. The consensus was that the industry faced several real constraints to development, namely: the general structure of the economy, timber supply, technical and financial assistance, forest regulation, and the apparent monopoly of Hyland Forest Products.

6.1 The General Structure of the Economy

All far northern jurisdictions in North America, including the Yukon, NWT, and Alaska are narrowly-based resource economies that are subjected to world prices for resource products and to exaggerated business cycles. The demand for forest products is derived from other economic activities such as construction or mining, and the exaggerated fluctuations in the level of economic activity in these regions increases the risk of business failure discouraging them from modernizing or expanding their operations.

Fuelwood, houselog, and pine seed firms felt that their demand had been growing steadily for several years and they were confident that they could maintain their market share despite the fluctuating economy. The sawn lumber manufacturers, however, felt the instability of the economy created such a significant risk that they could not afford to recapitalize their equipment if they were to survive during poor economic times. Moreover, they felt that large firms such as Hyland Forest Products, with high capital costs and large production commitment would not be able to survive recessions as easily.

Many operators indicated that the forest industry

provided a supplemental income in the winter to complement their main summer endeavors such as construction, placer mining, and transportation. For these operators, forestry provided one of the few means open in the Yukon for creating full-time employment from two seasonal activities. Significantly increased production to these operators meant that it would be more difficult to carry on these complementary occupations. These firms wanted to be assured an opportunity to harvest, saw, and market fuelwood or logs, but had little desire to expand or modernize.

This was particularly true in the smaller rural communities where the local domestic market was very small and the amount of potential market increase was also small. Most firms in these regions felt that the market size did not warrant significant capital investments.

Many owners were, however, interested in expansion. Firms were anxious to upgrade their equipment where feasible and to develop further stable markets for their products. Several fuelwood firms have purchased new equipment, as has the odd sawn-lumber manufacturer. However, it was clear that most wanted to improve their position through better use of existing equipment and no one was anxious to become too heavily dependent on financing equipment or materials, regardless of the source. Less than 10% of the firms had outstanding debt for their equipment and most wanted to ensure that it continued that way.

Despite their modest contribution to total output, the small forest operator plays an important role in the economy. The revenues generated by these operations are an important source of primary and supplementary income to both full- and part-time operators. They are an important source of lower cost wood-based products for use in local economies and substitute for higher cost imported goods. They often represent a major employment force in smaller communities and the income and profits derived from these firms tends to remain in those communities. And they often utilize more isolated tracts of land that would be considered uneconomic by southern operators. By financial definitions, these firms are not viable, but by overall economic and social criteria, they are viable and contribute to the economy.

Larger operators like Hyland Forest Products, of course, also provide significant benefits while in operation. Deloitte, Haskins and Sells estimated that there would be a total contribution of more than $3 million to the Watson Lake economy from the business, with forestry once again being considered the predominant industrial activity in the town of Watson Lake.

6.2 Timber Supply

Timber supply was the most often quoted concern of operators in every forest sector. The concerns were related to identification of the timber supply, access to that supply, and ownership of that supply.

First and foremost, sawn lumber manufacturers were concerned about the location and quantity of productive forest land available in their regions. At present there is no formal forest inventory data available that will allow operators to identify productive stands in their region. Insufficient timber supply data, in turn, prevented the development of longer range strategies to harvest volumes in excess of that demanded by the local market.

In addition, identified timber volumes within economical hauling distances often turned out to be inadequate to allow for better utilization of existing equipment. Most firms must determine their immediate requirements through ground inspections each year, as part of their logging efforts, and often are not aware of the most appropriate harvesting sites.

Commercial fuelwood operators appeared to have reasonably good access to fuelwood around Yukon communities and studies have indicated that there should be sufficient resources available for the next six to eight years in most regions. However, this time period is relatively short and several firms felt efforts must be undertaken immediately to ensure a supply of fuel for the longer term.

Pine seed producers felt that the present supply of cones was reasonably accessible, but several firms expressed concern about the possibility that cone areas with superior genetic quality, either identified or unidentified, could be logged by sawn lumber manufacturers and the pine seed industry seriously damaged.

The solution is a complete forest inventory of the Yukon. The Forest Resources Section of the Northern Affairs Program–DIAND (YUKON) has long recognized the problem and has made several attempts over the years to complete a full inventory. Commencing in 1985, DIAND began a multi–year project to complete a comprehensive forest inventory. To date, new aerial photography has been done for the southern part of the Yukon and by late 1988, there should be sufficient data in south–east Yukon to set an annual allowable cut. This will allow firms in the Watson Lake region, including Hyland Forest Products, to adequately plan development. Similar forestry data in the rest of southern Yukon will not be ready until 1991, and the data for the rest of the territory are not likely to be available until the end of 1994.

Funding for the present inventory has come from reallocation of federal funding priorities in the Yukon and from the Canada/Yukon Renewable Resources Subsidiary Agreement. However, future funding is not assured and until there is a financial commitment by government to complete the forest inventory throughout Yukon, many operators will not be in a position to safely make the required capital investment nor to undertake forest management initiatives.

Operators urged both levels of government to give high priority and assured funding in order to complete the inventory for the entire territory within the next two years. Moreover, they reiterated a request made in the Peschke (1986) report that government establish development areas or inventory zones around operating sawmills within which detailed inventory work could be conducted immediately[65].

The second component of the timber supply problem dealt with the concerns over access to the timber supply. Forest operators traditionally have had almost uninhibited access to the forest resource. In recent years, however, many owners believe that the land claims negotiations, the agriculture and homestead policy, the Quartz Mining Act, and other government regulations were beginning to seriously erode their ability to gain access to the forest resource. Moreover, several operators were harvesting the forest in close proximity to communities and feared they may lose their forest lands due to unanticipated conflicts with community land uses.

Forest operators recognized the need for government to address, systematically, alternative land uses. They were also anxious for both levels of government to negotiate a successful land claim that would remove the uncertainty of land access. In addition, they wanted a clear forest policy developed that reaffirmed the importance of forestry in the economy and developed a forest management regime that informed operators about their rights and obligations to the land.

Finally, forest operators were concerned about control over their land. Commercial fuelwood operators have been able to achieve some sense of control over their commercial resource through the federal government's practice of granting exclusive cutting areas. However, sawmill operators felt that they needed to have stronger control over the forest resource they harvest. At the present there are no operators who have tenure over forest land in Yukon past 1989 and most sawmill operators wanted government to institute a means of granting longer term tenure[66].

By granting longer-term tenure, these firms are better able to undertake longer-term planning and are better able to receive financing from financial institutions for any new developments they may wish to undertake. Traditionally, banks have been reluctant to provide funding for forest operations and the lack of longer-term tenure is one of the major reasons for that lack of support. New tenure rules or at least a more broadly based implementation of the present tenure arrangements is considered to be essential for further development of Yukon's forest industry.

6.3 Technical and Financial Assistance

Throughout the Yukon 2000 sessions and the personal visits to operators, there was a general consensus that all sectors of Yukon's forest industry could benefit greatly from improved technical and financial assistance.

This research confirmed the previous comments in the Peschke (1986) report about the lack of information and training amongst forest operators. While a few owners were familiar with the new technology in each of the forest sectors and appropriate operating and marketing procedures, the majority of firms indicated that they could gain significant benefits from improved technical advice and assistance.

Several owners for example expressed interest in obtaining further information on new types of portable sawmills, better operating procedures, new techniques for using their equipment, new products, and market prospects. In addition, owners expressed interest in receiving practical training in business management, lumber grading, exporting, and marketing techniques.

Information on various aspects of the forest industry come from a bewildering array of forest industry publications and organizations and deal with a variety of industry sizes and requirements. It is impossible to obtain complete information about the full spectrum of equipment or operating procedures in all the forest sectors from a single publication or organization. As well, specific mill information can only be gathered from first hand attendance at trade shows and through trade missions to prospective buyers.

Without ongoing technical assistance by knowledgeable foresters and mill operators, these suggestions, like those provided in the Peschke report, are not likely to be implemented throughout the industry. Technical assistance including: first hand forest advice, forest newsletters, forest research, product quality testing, forest library, business and management training, and regular government/industry contact are essential. Other industries such as mining, fishing, trapping, and agriculture have full-time government staff available to provide technical advice and release regular publications and reports.

Yukon's forestry offices have historically placed the highest priority on a single element of forest management, namely fire suppression, and very limited resources have been available to provide direct technical assistance to the industry. Efforts should be made to see if technical services can be provided to the forest industry in a similar manner to that provided to other smaller sectors such as agriculture.

To demonstrate the positive benefit of providing technical assistance, the impact of lumber recovery on costs and revenues is shown. As indicated earlier, improvements in lumber recovery can increase industry revenues. If Yukon firms can increase production by 25 fbm/m3 of log harvested through a thinner kerf saw, then there would have been an additional 968 100 fbm of

lumber, worth $309 760, produced from the 38 754 m3 of logs harvested in 1986/87. Moreover, 968 100 fbm in potential forest products would not have been wasted by being turned into sawdust or slabs, or 5233 m^3 less wood could have been harvested to produce the same 6 MM fbm of lumber. The savings in logging costs by not harvesting the extra timber volume is estimated to be $88 000.

For government there are also savings. Reducing timber waste improves the environment, allows alternate users more use of the forests, and prolongs the harvesting, while federal government revenues on the extra 968 100 fbm would have increased by $77 440, based on the 8% sales tax.

One special technical problem suffered by operators is the lack of marketing support. Most studies into forest marketing in the Yukon indicate that it would take a full-time forest marketing person to develop and maintain markets outside of the local community. Total costs for such as service are at least $50 000.

For a large firm such as Hyland Forest Products, the costs can be spread out over a very large volume of production with per unit costs as low as $2.50/M fbm. For smaller Yukon firms, production levels are less than 500 M fbm and similar professional marketing would cost upward of $100/M fbm. Yukon firms could benefit significantly from dramatically expanded assistance for marketing forest products.

In short, the technical assistance provides operators with a means to produce products more efficiently and reduce operators costs, it provides a means to more effectively harvest the forest resources, and it provides the framework for increasing government revenues, without adding to the existing tax base.

Financial assistance was another area where operators felt that they were at a disadvantage. They were pleased to see that the government had instituted a broad range of financial assistance programs for Yukon business, including those for opportunity identification, road construction, inventory financing, and capital equipment assistance. However, many operators interviewed felt that the government had made the rules so complex and the procedures so cumbersome that the amount of financing available did not justify the applications costs. Some operators were particularly concerned about the problems concerning federal financing under the Canada/Yukon Small Business Incentives Subsidiary Agreement and about the confusion over the inventory financing program.

Several firms were also concerned that business advisors were not well enough informed about the various programs to provide useful assistance and often were more involved in the administration of the programs than in providing assistance to the clients.

The major suggestion by forest operators was for government to ensure that the programs met the needs of the clients, that officials communicate its programs more effectively to clients, and that government business programs make efforts to reduce the red tape associated with obtaining funding.

6.4 Government Regulation

Throughout the research on the forest industry, there existed a consistent undercurrent of concern by operators regarding government policy and regulation of the forest industry. The concerns related largely to two areas of government activity: forest policy and management, and government purchasing policy.

As indicated earlier in this report, forest operators recognize that they are only one of several user groups of the forests in Yukon but several operators felt that the role and importance of forestry was being diminished by the lack of a clear forest policy. Land claims, the Quartz Placer Mining Act, the Homestead Policy, the Pounds Act, and the Yukon Land Use Planning Agreement are a few of the present government initiatives that interact with forestry It was unclear to these operators where the forest industry stands in relation to these policies, how forestry is viewed in relation to other competing resource uses, and what if any restrictions will be placed on forest development.

These firms saw a clear need for a government forest policy to clarify the situation, reduce the uncertainty surrounding the industry, and provide firms with a consistent regulatory framework that allowed them to develop plans.

Second, many of the operators were concerned about the lack of a comprehensive forest management program within the Yukon. Several respondents indicated that while protection of the forests from fire appeared to be a high priority and adequately handled at present, the other aspects of forest management dealing with harvesting, tenure, infrastructure development, timber utilization, reforestation, economic rent (stumpage), and environmental protection appeared to have a much lower priority and substantially less funding.

As a result of the lack of clear forest management guidelines, firms felt that local resource officers applied the rules in an inconsistent manner. In some cases the officers were advocates, actively assisting operators, and in other cases they were seen as enforcers imposing unnecessary restrictions on forest development. The forestry firms also felt that the rules were often so vague that it meant that officers could not enforce abuses of proper forest management or protect operators from infringement on their tenured property[67].

The one project that seemed to crystallize every respondents' concern about forest management was the proposal by Makin Pulp and Paper Co. to obtain cutting

rights to land in the Whitehorse district. Every person had an opinion and while there were only a few people who were actually opposed to the project, everyone felt that a forest management regime must be put in place before it could proceed.

Respondents asked questions like:

- Why can Makin get a timber harvesting agreement and long-term tenure, while small operators cannot?
- What is the process for applying for a timber harvesting agreement?
- What conditions will be placed on the agreement, regarding clearcutting, forest waste disposal, and reforestation?
- Will Makin have different stumpage charges than other mills?
- Will Makin be able to chip the timber that can be more profitably sawn into lumber products?
- What type of environmental review process will they have to go through?
- Can the company prevent houselog operators from taking out select wood for use in home building?
- What length of tenure will there be and what government action will be taken if the company fails to meet the terms and conditions of the agreement?
- Is government establishing two sets of rules, one for large firms like Hyland and Makin and another set for the rest of the small businesses?

The problem stems from the lack of clear and enforceable forest management guidelines and regulations. John MacTavish and Dendron Resource Surveys Ltd. (1982) undertook a thorough evaluation of the Northern Affairs Forest Management Program in 1982 and his conclusions echoed many of the concerns expressed by the forest industry people who were interviewed.

The MacTavish study concluded that Northern Affairs needed to develop an integrated forest management regime, that its weak legislative capacity needed to be strengthened, and that more funding was needed to support forest development in the territory[68].

Forestry officials in the Yukon are well aware of the problems inherent in the system and are equally anxious that a better system of forest management be implemented. But they are constrained by federal legislation and a lack of manpower and funding to provide basic forest management. They may also have to await the transfer of control over forestry from Ottawa to the Yukon government before proceeding.

Today there appears to be more interest than ever in development of Yukon's forest resources, with new projects being considered regularly. Wood-fueled hot water heating systems, a new government-owned sawmill and business proposals for tree nurseries, specialty planing mills, pulp chip plants, and integrated sawmill operations. However, the policy and the guidelines to support, encourage, and monitor responsible forest development are not there. Forestry officials are constrained in their ability to make improvements or to obtain the necessary funding for basic forest management. It seems that there is an incentive for both the Yukon government and the Yukon Indians, as the prospective forest resource owners, and the federal government, as the existing resource owner, to develop a policy and forest management regime. Clearly, there is an immediate need to begin the process of working toward an integrated forest management system

Several people, especially those in rural areas, were also concerned about the Yukon government's purchasing policies and felt that they presently helped to discourage the local production of dimensional lumber products. These respondents believe that government policies specified kiln-dried products, and personnel purchased these products even when air-dried or rough products produced locally would have been equally applicable[69].

Others were concerned that the tenders by the Yukon government for fuelwood were too restrictive, specifying solid fire-killed material when slabs and wood residue could be used. Finally, others felt that the Yukon Government Services department was opposed to new forms of wood-based heating technology and were actively attempting to discourage development of these types of wood-based heating systems.

Forest operators requested that government review its purchasing policies to allow local Yukon firms greater ability to supply green or air-dried products and wood residues where ever possible. As well, they requested that government make a better effort to send purchasing agents to rural communities to see the types of goods and services these operators could provide on construction projects rather than solely relying on Whitehorse contractors or distributors.

Rough lumber and milled logs could be used in facilities such as campgrounds, playgrounds, outdoor sheds, and wood panelling on offices instead of gyproc. Stackwall buildings, post and beam construction, and natural log facilities were also suggested as possible local building construction techniques that would enhance the use of local forest products on government projects.

Operators were apprised that changes in government purchasing rules to support the local use of wood could only be successful if sawmills could provide quality products that had been properly graded to meet Canadian Lumber Grade Association standards. This in turn meant that these firms must become members of an established lumber inspection system. Operators felt that if government took more effort to use their products, they would have an incentive to become actively involved in a lumber grading and inspection system.

6.5 Monopoly Power

For the most part the forest industry in Yukon operates in a competitive manner. Overall, the relatively low cost of starting a business makes entry and exit easy. There are generally a relatively large number of firms competing in the market place and most firms have such a small portion of the total market that they must accept the going market prices. The fuelwood and houselog sectors in particular are highly competitive, with the result that consumers obtain prices that are lower than similar alternative products, like propane or fuel oil.

The logging sector also appears to be fairly competitive, with six logging firms bidding on the first Hyland Forest Products logging contract in 1987, and with a similar number registered with the company for upcoming contracts. Most business, however, is generated by personal contacts rather than tenders and a strong personal relationship generally exists between the loggers and sawn lumber manufacturers. Few Yukon loggers are engaged in logging activities outside of the Yukon, although the larger firms have on occasion had contracts in British Columbia.

The degree of competition in the logging sector tends to vary, depending upon the size and profitability of the mill, and seems to vary directly with the amount of complementary business available to the logging contractor. If logging contractors have hauling or construction contracts during the logging season, then prices for harvesting rise and vica versa. The capital costs of getting into the industry are quite high so the numbers of firms are somewhat restricted. This, however, has had only a limited effect upon the customers, sawn lumber manufacturers, as these businesses are usually integrated firms who can undertake the logging directly if competitively priced logging contractors are not available.

Pine seed production operates in a modified form of competition. Each Yukon firm has a tied sales contract with one of three established seed extraction firms in British Columbia and picks cones for these firms at a set rate. The rates are established each year through negotiation and depend upon the demand for seeds by foreign suppliers. The existence of the three seed extraction firms appears to stimulate competition among pickers but further forward integration into seed extraction by Yukon firms would likely provide a dramatic increase in the value of the industry within the territory.

The sawn lumber manufacturing sector is an anomaly in the forest industry. This sector can in many ways be characterized as monopolistic competition. There are a large number of small firms in the sector, with no single small firm able to take over a large segment of the market. There was also strong competition from southern lumber suppliers on a variety of products, particularly dimensional lumber. The small firms had reasonable capital costs for the equipment, and second hand mills were readily available, leaving few barriers to entry or exit.

On the other hand, Yukon sawn lumber manufacturers provided a service to specific market segments, such as timbers, rough lumber, and staking posts, and usually did not compete directly against each other. Most rural firms have either a monopoly in their local area or the firms have tied sales contracts with individual companies. Beaver Creek, Haines Junction, Teslin, and Dawson City have only one mill, while many firms in the Whitehorse region supply small local hard rock mines or exploration companies such as Mt. Skukum or Omni Resources. In these instances, local firms establish the price dependent upon costs and the buyer. Often having few alternative sources, companies tend to buy from that mill.

In Mayo, the opposite exists. United Keno Hill Mines is a single buyer, which buys its timber at a fixed price from all three firms in the area. If a firm can produce and sell at that price, it is granted a contract and if it cannot meet the price, it receives no business.

The limited competition among firms, the small market for rough lumber products and transportation cost barriers allows a number of firms to operate in smaller communities that might otherwise not exist.

The reopening of the Hyland Forest Products mill in mid–1987, however, disturbed this balance because it left open the possibility that Hyland could take over the entire forest products market, or at least prevent other firms from expanding. Many sawn lumber manufacturers seemed afraid that Hyland Forest Products would be able to undercut their prices and force some firms to close[70].

The Hyland mill is a random length dimensional lumber mill that can produce any length or width of material, subject only to the constraint of log size. The mill will not produce products as rapidly as southern-based mills, but it has the capability to be far more flexible in its production processes. The mill is capable of producing the full range of rough or planed, green or dried sawn lumber and is potentially able to meet 100% of the total market requirements in the Yukon. Moreover, the firm embarked on a multi–million dollar recapitalization plan in 1987 that will allow it to take advantage of savings or economies of larger scale operations while producing a good quality material.

Unlike southern mills, the new Hyland Forest Products mill will be capable of competing directly with small firms in their traditional markets for mining timbers and houselogs as well as competing with efficient southern suppliers for the dimensional lumber markets.

The highly competitive nature of the dimensional lumber industry throughout the world means that Hyland's prices for standard dimensional products will be set competitively and the consumer will likely see no difference. In the timber and houselog market segments,

competition by Hyland could result in downward pressure on the price of rough sawn lumber and a reduction in the gross return by small operators.

Most smaller operators require a good margin on their small volumes to break even, and to compete the small Yukon forest operators will be forced to begin initiating improvements in their operations. However, these firms do not have the financial strength to undertake any modernization, without government assistance, and in the absence of that assistance some firms may exit the industry.

Several operators felt that Hyland Forest Products, now a government-owned company, had an unfair advantage over the small competitors. Many owners made comments such as:

- Hyland has new capital equipment; small mills do not.
- Hyland has access to low cost funding, while other firms do not.
- Hyland has a dry kiln; small mills do not.
- Hyland has a cogeneration facility; small mills do not.
- Hyland can afford to hire a marketing agent; small sawmills can not.
- Hyland can afford to cruise their timber; small firms can not.
- Hyland can accept a lower price per M fbm because of large volume; small firms cannot[71].

Several firms were particularly concerned about the potential negative effects if the lumber market goes soft in future years as it did in the early part of the decade. While the private sector operator, saddled with high capital costs and declining markets, went into receivership, a government-owned mill may continue to operate at a loss in order to sustain the jobs and charge prices that were so low as to force the smaller firms throughout the territory to go out of business.

The situation appears to be quite unique. There does not appear to be another similar situation in North America where there is a single large scale government-owned sawmill, with a multi–purpose facility capable of meeting all the domestic sawn lumber requirements of the region, and a large number of very small firms, none of which is capable of assuming more than a small portion of the market.

In other regions of Canada and in Alaska, there are several large mills, competing in a variety of product lines, sometimes one of which is government owned, and numerous small firms, producing and selling distinctly different products that are not produced by the larger firms. There is competition among the firms within each group, but for the most part the two size groups do not compete directly for market share.

This type of government-owned mill has the potential to be a monopoly in the territory, and government policy should be initiated to protect the public and competitors from actual or perceived unfair competition. Public utilities boards have been established in the transportation and electrical generation areas to protect against the negative affects of monopoly power, and serious consideration should be given to developing similar protections for the forest industry.

7.0 CONCLUSIONS AND OPTIONS

This study looked at the history, structure, and performance of the major sectors of Yukon's forest industry. The forest industry could best be summarized as a series of small sectors dominated by entrepreneurs whose small businesses are located in communities throughout the territory and whose major products have been fuelwood and rough sawn lumber. Moreover, the study showed that the fuelwood sector has been the largest element in the industry for the past eighty years, with sawn lumber products dominating only in the seventies when Yukon Forest Products mill in Watson Lake was operating. Even in 1986/87, the fuelwood sector was the largest single component of the forest industry accounting for almost half of all industry activity.

The Yukon Forest Industry Survey provided a broad picture of the industry showing that the logging sector consists of longer term Yukoners engaged in a combination of forestry and other complementary businesses. The loggers are predominantly single proprietorships employing only a few people each and providing direct service to a handful of non-integrated sawmills. Investment in the industry is not extensive but has grown significantly in recent months with the restarting of the mill in Watson Lake. The logging technology is fundamental and highly labour intensive but provides a competitively priced service consistent with the requirements of the Yukon sawn lumber manufacturing sector.

The sawn lumber manufacturing sector consists largely of long-term Yukoners who engage in relatively low production milling, employing an average of four people per firm. Sawn lumber manufacturing firms are largely run by single proprietors although the largest firms are corporations. Sawmill owners engage in forest production as part of a full employment plan that consists of winter seasonal logging/sawn lumber production combined with complementary summer seasonal occupations. Investment in this sector was less than $3 million in 1987 and the milling equipment consists of basic circular head saws and a few planers and edgers that were purchased used, and are more than 25 years old. The technology

dates to the turn of the century, but these firms are not unlike small sawmills operating throughout western Canada today. The new Hyland Forest Products mill is an example of the recent move to new technology in the Yukon, combining the basic circular headsaw with more sophisticated multi-saw equipment and semi-automated production systems.

The houselog sector is a very small component of the industry that markets an old technology to a small but stable segment of the economy. Some automation exists in the industry, but most of the activity involves the building of custom, natural log homes for specific clients, using highly skilled crafts people.

The pine seed sector is a very small but thriving segment of the industry. Pine cone collection is largely done by Yukon individuals and small firms that have been in existence since the early 1980's. Investment in the industry is small but the sector does provide seasonal income to a broad variety of citizens.

Indians are involved in all aspects of the forest industry, from logging through milling to houselog production and pine cone picking. There are four Indian logging firms, one active Indian sawmill, a houselog producer, and a pine cone picking firm. As well, all twelve Indian bands are involved in commercial fuelwood production. Indian employment in 1986/87 could not be determined precisely but at least one third of all jobs in the industry were performed by Indian people.

The forest industry as a whole contributes only about 1% of the total Gross Territorial Product (GTP) but provides an important source of income for Yukoners throughout the territory. The industry directly employed more than 175 people in 1986/87, produced more than 1433.5 person months of employment, and created more than $2.25 million in wages and salaries. In addition, the industry created more than 920 person months of employment throughout other sectors of the economy, bringing total employment to more than 2350 person months. The income from those jobs was largely spent within the territory and the profits accrued to Yukon citizens.

Yukon fuelwood, houselog, and pine seed sectors appear to be highly competitive, with no single operator controlling a significant share of the market. Production costs are well below the prevailing market price, providing a good return for existing operators. The logging industry also appears to be reasonably competitive with costs similar to those in northern B.C. regions and the NWT. However, a part of the cost advantage is the result of low stumpage fees in the Yukon.

The sawn lumber manufacturing sector faces operating costs that are significantly higher than southern firms. However, the market for rough timbers is relatively strong in the Yukon, and the natural transportation tariff barrier allows small firms to make a reasonable gross return on their endeavors. However, despite higher transportation costs for southern sawn lumber producers, Yukon firms barely breakeven on sales of dimensional lumber products and have little incentive to produce dimensional lumber products. Given that the market for rough lumber is only 20% of the total demand in the territory, small firms presently have only limited opportunity to expand.

As long as sawmill owners continue to consider sawmilling to be a component of a year-round employment plan, it can provide a reasonable supplemental income. Moreover, many operators appear to gain a great deal of satisfaction from the operation of their mills and may continue producing even to the point where they are just breaking even. The operative phrase for several operators was, "its a hobby that makes me money".

Hyland Forest Products appears to be the only Yukon firm that presently has the capability to competitively supply good quality kiln-dried lumber to the dimensional lumber market. Once the new capital equipment is installed and fully operational, costs should decline to within $70/M fbm of southern firms and in line with present wholesale prices. Given large volumes of product, Hyland can afford to assume a lower return on each M fbm and still provide a reasonable return on investment.

Sawmill and logging firms in Yukon have room to improve their operating and technical efficiency, but it is clear that small operators can survive in the present market place. The small Yukon firms can be efficient at producing rough sawn lumber products and high value specialty products, while it is the very large firms, such as Hyland Forest Products, who can most efficiently produce dimensional lumber. Intermediately-sized firms are disappearing from the forest industry, and Yukon firms should be careful about attempting to expand capacity into this intermediate range.

Small mills survive precisely because they are often fully integrated and involved in every phase of the production process from tree to customer. This means that moving to highly specialized production between logging and milling may reduce, not enhance, the profitability of firms. Logging firms outside of those supporting Hyland Forest Products are not likely to be in a position to profitably utilize the new highly mechanized logging systems.

Development opportunities for the forest industry include the use of wood residues and fuelwood in wood-fueled central hot water heating systems to provide heat to industrial consumers and replace the use of fuel oil. They also include fuelwood exports to Alaska, exports of dimensional lumber, and specialty products such as siding, flooring, joinery stock, and laminated wood products to Alaska, the NWT, the Pacific Rim, and the United Kingdom.

However, the report also outlined several constraints

that inhibited forest industry development. The constraints suggested during the interviews were: the economic structure of the Yukon, timber supply, financial and technical assistance, government regulations, and monopoly.

As indicated at the beginning of the report, Yukon's forest industry appears to be at a crossroads in its development. Longer term forest operations are finding their equipment near the end of its useful life. Also, competition is increasing and product requirements are changing. On the other hand, government has spent millions in installing newer technology at the Hyland Forest Products mill while several smaller operators are engaged in a number of new forestry related endeavors, from co–generation to integrated forest operations.

To meet the challenges of the future it seems appropriate now for industry and government to consider what changes must be made to enhance the profitability and stability of the industry while improving overall management of Yukon's land-based resources.

After undertaking the research for this study and talking to the majority of industry operators, it appears that the requirements for the industry can be condensed into four main requirements, namely:

1. forest industry resource information,
2. technical advice and assistance to all sectors of the forest industry,
3. formal forest policy and a forest management regime, and
4. research and development funding into various aspects of the forest industry.

In addition, there is a need for governments to continue to encourage firms in the forest industry to take advantage of the existing generous funding from the Canada/Yukon Renewable Resources subsidiary Agreement, the Canada/Yukon Small Business Incentives Subsidiary Agreement, the Yukon Roads to Resources Program, the Yukon Business Loan Program, and the other Yukon and Federal government assistance programs.

7.1 Forest Industry Resource Information

A variety of information is required on the location, size, species, log volumes, and allowable cuts for forest products in the Yukon. Other data are required on lumber recovery, the quality of Yukon species compared to other regions, and prime reforestation areas. This requires research to be undertaken to develop a comprehensive forest inventory and data on product yield, product quality, and equipment efficiency.

The Forest Resource Division of Northern Affairs–Yukon have managed to complete part of the initial forest inventory work in the southeast Yukon region, but funding is not assured for the remainder of the Yukon. In addition, site specific and comprehensive forest resource data are not available to firms.

Efforts must be undertaken to ensure that the forest inventory is completed and that a comprehensive forest data management information system is designed over the next decade that is comparable to that existing on the Prairies or in Alaska. There are several options open to the Yukon in order to obtain this information, including:

1. signing a multi–year Canada/Yukon forest industry subsidiary agreement,
2. developing a preliminary research plan and funding this research through the existing Canada/Yukon Renewable Resources subsidiary agreement,
3. conducting detailed forest inventories in specific areas in close proximity to existing operators, using funds from the Canada/Yukon Renewable Resources subsidiary agreement, and
4. negotiating an agreement with existing forest research facilities including the Canadian Forestry Service, the UBC Forest Economics and Analysis Project, the FERIC and FORINTEK corporations and/or the Forestry Department at either the University of B.C. or the University of Alberta.

7.2 Technical Advice and Assistance to all Sectors.

There appears to be opportunities for significant savings to forest operators in all sectors if they receive ongoing technical assistance. Firms require knowledgeable experts to provide advice and assistance on initiating operational improvements, finding and evaluating new technology, disseminating the benefits of new technology to operators, and helping firms to implement the new changes. As well, firms, especially small firms, require assistance to identify and penetrate new markets.

Forestry experts could also be provided to conduct research on the forests, to develop an industry data system, including items such as scaling manuals, sawmill studies, and manufacturing inspections, to organize a lumber grading system, to assist firms in determining the most appropriate areas for harvesting, to organize rational forest industry infrastructure plans, and to encourage new investment in the industry.

The staff requirements are not onerous at the present time, as one or two person-years would likely be sufficient to assist the industry to make significant improvements in its productivity. As indicated earlier, modest improvements in sawn lumber production alone could net government revenues of $77 000 /yr, a sum that would almost cover any additional administrative costs.

Firms in the agriculture, mining, energy, and fishing industries have benefitted significantly from the receipt of various types of specific technical assistance, and forestry will likely react in a similar fashion.

Several options and combinations of options exist

for providing the appropriate assistance, namely:

1. negotiating an agreement with FORINTEK and FERIC (non–profit organizations specializing in logging and sawn lumber manufacturing research) to provide the required technical assistance,

2. following the recommendation of the Yukon Forest Industry Association to create an Office of Forest Products and hiring staff within government to provide the required technical assistance, (the staff could come through new staff hired by the Yukon government or from a reorganization of the Renewable Resources section of Northern Affairs),

3. negotiating a funding arrangement with the the Yukon Forest Industry Association to allow them to provide the assistance (the Association would charge each firm participating in the program a basic fee and government would provide financial assistance to cover the extra costs. In the NWT each firm is charged a fee on the basis of the amount of wood harvested), and

4. providing direct subsidies to individual companies to allow them to hire the required expertise.

In addition, the existing Yukon and federal govemment staff should continue to encourage firms to use the existing funds from the various government programs such as the trade mission and opportunity identification programs to pursue business opportunities.

As well as direct technical assistance, the industry would benefit from improved access to training and education programs. Initial efforts are underway to provide training, and lumber grading courses have been provided around the territory. Further assistance could come through a specific set of courses being established to provide forestry training to Yukon firms. The training would be a combination of forestry specific courses and more general business administration courses.

In order to provide this training there are several alternatives:

1. The Yukon College could develop a forestry program for forest operators.

2. The training programs available through the B.C. Council of Forest Industries, FERIC, and FORINTEK could be utilized.

3. Assistance to the Yukon Forest Industry Association to develop the courses could be provided, or

4. A deal for another university or agency to provide training could be negotiated.

Finally, Yukon firms, especially the smaller firms, need to be provided with marketing expertise similar to that being provided at Hyland Forest Products in order to effectively promote and sell their products. Several suggestions have been brought forward to assist the industry in its marketing:

1. provide financial assistance to the Yukon Forest Industry Association to allow it to market on behalf of the industry;

2 develop a government-operated marketing program for the forest industry;

3. negotiate an agreement to have a lumber broker (such as Hakai Forest Products) sell Yukon forest products on behalf of all Yukon forestry firms;

4. negotiate an agreement to have the B.C. Council of Forest Industries conduct the marketing on behalf of Yukon firms; or

5. encourage Yukon firms to use the existing trade assistance in order to market their forest products individually.

Yukon firms that were members of any of the alternative methods of co-operative marketing would be expected to pay a standard fee for each M fbm of sawn lumber sold, and government would be responsible for assuming the additional costs. In the NWT, each participant pays a fee of $0.77/M fbm, and the government pays the remaining costs. The total cost to government could be in the range of $25 000–$30 000 /yr.

7.3 Formal Forest Policy and Forest Management Regime

The report indicates that the lack of a formal forest policy and forest management regime constrain firms by restricting access to the forest resource, inconsistently or ineffectively applying the existing regulatory rules, and obtaining insufficient rent from the resource. The lack of a proper regime also impedes efforts to ensure a long-term supply of merchantable timber and an ongoing and viable industry.

There are several options available for providing the necessary forest management regime, namely:

1. have the Yukon government prepare and pass policy and legislation that is administered by the federal government until the resource is transferred to Yukon;

2. modify the existing Territorial Lands Act and accompanying regulations to create the necessary management environment;

3. use the existing framework of timber harvesting agreements to develop a consistent management regime with operators in all sectors;

4. informally establish longer-term tenure arrangements and forest management regimes with individual operators; or

5. negotiate an agreement with an independent organization or firm to prepare the necessary policy and legislation over the next year and implement those elements under existing legislation where possible, and leave the remaining items until a forest transfer is complete.

There are numerous legal and administrative impediments to having the Yukon government pass legislation that will be administered by Ottawa prior to the transfer of responsibility, or to revise existing federal

legislation. As such, it would likely be most appropriate for governments to consider one of the other alternatives as a means of moving towards a stronger forest management regime. The timber harvesting agreement, in particular, is an existing legal tool that can be applied more broadly in an effort to increase the forest management authority in the territory.

7.4 Research and Development

The forest industry requires further research into, either potential new forest products that can be produced by Yukon firms, or existing products which can be produced by Yukon firms. New housing designs that maximize the use of local lumber, new forest products such as parallam, and special technical equipment for use in Yukon's forest operations must be investigated in order to ensure that Yukon firms can take advantage of opportunities for future growth and development.

As well, active work needs to be undertaken to determine the quality of Yukon's wood resources compared to other regions, new methods of road construction, methods to grade and inspect lumber, new types of wood drying, silviculture preparations, and methods to grow better quality trees in a shorter period. Marketing research, trade development, and consumer preference studies should also be conducted on a regular basis.

Several alternatives exist to develop a research and development program, namely:

1. contract with FORINTEK, the Canadian Forest Service, or a university, to conduct the necessary research;
2. establish a research facility at Yukon College to assist in forestry research;
3. encourage firms and universities to make more use of the Canada/Yukon Renewable Resources subsidiary agreement to conduct research identified by the forest industry; or
4. negotiate a new Canada/Yukon forestry subsidiary agreement as a means to conduct the specific research.

Both FORINTEK and the Forestry Faculty of the University of British Columbia have expressed very strong interest in becoming more involved in the design and implementation of a forest research program in the Yukon and efforts to foster this interest should result in good quality cost effective research that is of use to the entire forest industry. Cost-shared forestry subsidiary agreements intended to provide this type of research have been negotiated between Canada and every province. Only the northern territories have not received cost-shared funding, and serious consideration should be given to negotiating a subsidiary agreement to obtain the required funding for research and forest management.

In conclusion, it is clear that the Yukon forest industry is a small but vital element in Yukon's economy, and with active participation by industry and government, significant improvements can be made in the industry.

FOOTNOTES

1. The survey, entitled the Yukon Forest Industry Survey, obtained information from over 90% of the respondents ,and when combined with forestry records, provides reasonable estimates of the structure and economic activity existing within the industry.

2. Bickerstaff, A. and T.G. Honer. 1985:57

3. Detailed figures are provided in Table II–1 in Appendix II.

4. Berton, P. 1958:63

5. Robinson, J. L. 1945:42 The report indicated that many thousands of cords of wood had been cut on mining claims and sold to Yukon communities without a royalty being paid. In addition, it appears that most of the lumber cut was milled from mining claims and not recorded, as official records show no lumber production for a population base of more than 27 000 people. The Quartz Mining Act Section 72(1) allows the holder of a mineral claim to cut, free of dues, such of the timber as may be necessary for the working of the claim. While it was illegal to sell the material off the claim, it was obviously done frequently in those early years.

6. Cory, W.W. 1915:42

7. Roche, W.J. 1916:192

8. Robinson, J. Lewis 1945:71

9. Merrill,D.F. 1963

10. Tait, Dave 1980:1

11. Ibid: 1

12. Table II–3 provides the numeric totals for the production and value of Yukon's forest harvests from 1960 to 1986. Table II–2 provides the prices for production in the various years and was provided from reports and correspondence in the files of DIAND–YUKON.

13. Springate, N. and Associates 1979:4–6

14. Campbell, N. 1987:3

15. Knowler, D. 1987:31. Domestic fuelwood production is an important component of the subsistence economy, but is not included in this report as it is a non–market activity.

16. The total investment does not include the value of logging equipment that is held by sawmills who are engaged in both logging and sawmilling. The value of that equipment has been included with the sawmilling sector.

17. In total, there were 28 actual sawmills identified in the survey. Of the 28, three were used exclusively for personal use, a further 7 mills that normally operate were closed in 1986/87, and 2 new mills were purchased in 1986/87 but were not operational at the time of survey.

18. In total there were 6841.6 MM fbm of lumber permitted by the Department of Indian Affairs and Northern Development. A portion of the timber at the Watson Lake sawmill was cut into lumber in 1986/87 by a firm operating for the receiver, but some of the product re-

mained as logs until after April 1,1987. Nonetheless, the entire production level was used because much of the other data covers the period June 1986–June 1987, and production was underway at the new mill in May and June.

19. Ondro and Williamson (1984), Ondro and Williamson (1985), and Bohning (1986) provide information on foreign control of the forest industries of the prairies.

20. Several mills were built by Coutts Machinery of Edmonton, Alberta or National Machinery Co. of Vancouver, B.C., but more than half were manufactured by the owner using the basic design of circular saws and used parts often purchased over a long period and from diverse sources.

21. Ondro and Williamson (1984), Ondro and Williamson (1985), and Bohning 1987 all make reference to the trend to new technology in sawmills in the prairie provinces.

22. Vertically integrated firms are those that carry out successive phases of the same overall production process. Horizontally integrated firms are multiplant operations that own and manage a number of geographically distinct plants, each producing a similar product. Ondro and Williamson (1984) provide a more thorough discussion on pages 19–21 of their report.

23. The Indian bands produce 150–900 cords annually for use by their citizens. The market value of this wood is based on an estimated production of 4750 cords at $75/cord or approximately $360 000 annually. Only a portion of the wood is actually sold through the open market and is largely unaccounted for in the data included in the tables.

24. It was assumed that commercial operators had an average of $10 000 each in equipment, and that the part time operators had $1000 each in equipment. Therefore, 37x10 000 plus 30x1000 brings a total of $400 000 in investment. Of course, some operators had relatively new equipment such as a 1984 GMC 5 ton truck valued at $37 500, but most used older equipment. Moreover, most operators used their equipment for other uses and not all of the costs can be associated with the fuelwood industry.

25. The productive potential or installed capacity of Yukon's forest industry firms at any point in time is directly related to the industry's stock of capital. It represents the maximum productive capability of the firm, assuming that it is fully utilizing its capital stock.

26. Installed process capacity means "the maximum output obtainable under normal technological and market conditions" (Statistics Canada, 1978, p. 6). Process capacity defines the production capability of the entire production line. The installed capacity of the firm is functionally dependant on the technology available to the firm. The technology in turn depends on the number, size, and type of capital items available to the firm and how these capital items are arranged.

27. The low levels of capacity utilization, in part, are due to the type of material put through the small mills. The smaller mills have much higher utilization levels for producing timbers than dimensional lumber. A mill with an engineered capacity of 10 M fbm/8hr shift can easily produce 8 M fbm/shift of timbers but is likely to produce less than 4 M fbm per day of dimensional lumber products due to the fact that there are only four passes of the carriage required to create timbers while it would require at least 8 passes of the carriage to produce dimensional lumber.

28. The larger mills are likely to have much higher utilization in 1987/88. These firms were not operating for part of 1986/87, and when operating, were not running at full capacity. However, with the installation of new equipment in 1987 and with new contracts, these firms are likely to be able to reach much higher levels of capacity utilization.

29. Hyland Forest Products is a member of the Northern Interior Lumber Sector of the B.C. Council of Forest Industries (COFI) and has its lumber inspected regularly by COFI to ensure it meets the Canadian Lumber Standards. No other sawn lumber manufacturer in the Yukon officially grades its lumber. Producing lumber to meet the Canadian standards is not required in many construction applications, but is used by Yukon consumers and foreign buyers as a certification, setting out the quality of the material.

30. For more detailed information on the present Yukon markets for forest products see Heartwell (1987).

31. The domestic producer is estimated to provide 30.5% of the total fuelwood production in Yukon. Using the value of 40 cords per person month of employment, and based on the production figures for 1986/87, there would be 330.26 person months of employment created or 27.5 person years.

32. This does not mean that the average worker received $15 700/year in salaries. Since most employees worked for less than 6 months their actual income would be much less than this amount.

33. See Ondro and Williamson (1982, 1984, 1985) and Bohning (1986) for a more detailed discussion of the multiplier effect on the forest industry.

34. The Manitoba forest industry appears to be close to Yukon's in terms of its size and contribution to the provincial economy. As such, the data from this region is assumed to be that for Yukon. The multipliers for Yukon in fact are likely to be slightly lower than the Manitoba economy as the Yukon economy has a very small open economy and obtains a large portion of its goods and services from outside the territory.

35. Appendix I outlines the process taken to derive the final numbers for the Yukon Forest Industry survey.

36. The production costs are restricted in the section to operating expenditures, that is the direct and indirect

costs of production. Capital expenditures are discussed in general terms, but most firms, with the exception of Hyland Forest Products, undertook only minor capital expenditures during the study period and had virtually no financing costs.

37. The conversion is based upon a recovery factor of 176 fbm/m^3 of sawlog.

38. Hyland Forest Products is required to pay a stumpage rate of \$0.45/m^3 as part of the terms and conditions of their Timber Harvesting Agreement with the federal government.

39. Production cost data was obtained from almost every firm but it was felt that to protect confidentiality the data should be reported only for the entire sector rather than by categories.

40. Most business practices would indicate that the owners should pay themselves a wage equal to the industry rate for the job being performed, before determining profit. However, many owners do not do this and therefore the operating profits of the firm are generally reported higher than they actually would be for larger manufacturing facilities.

41. Extensive efforts were made to obtain data for Alaska and the Prairie provinces for equivalent sized mills. Production data was readily available in the late 70's in these regions as stumpage was tied to production costs, but in the 80's, governments on the prairies went to fixed stumpage fees, and virtually no production data has been gathered since that time. Data is available in Statistics Canada but it tends to cover only the large efficient mills and is usually three years old.

42. Price Waterhouse Ltd (1986) provided comments on the Survey of Interior Sawmill Production Costs done for the B.C. Government Timber Appraisal System, Vancouver, B.C., 1986, p.6.

43. Based on information supplied in Loeks (1986) and Ference (1987).

44. The going price for fuelwood in Whitehorse depends upon the length of the wood. It can be provided in 8',4', 2', and 18" pieces. Prices range from a low of \$60/ cord for the longer lengths to \$85/ cord for the shorter lengths. Production costs rise as the length decreases. However, if one assumes that the price increase accounts for the extra production costs, we can use one of the lengths as being representative.

45. This is based upon the Yukon Bureau of Statistics employment survey and relates to those firms who have indicated to the government that they are engaged in a commercial fuelwood business. While part of the total increase may be as a result of poor response rates, most of the new firms listed have had business licences for less than one year, according to the Bureau staff.

46. Peschke (1986:71)

47. Nagle (1980:10) reported that the appropriate form of logging depended upon the terrain, logging volume, and transportation distance to the mill. The use of a labour-intensive operation with rubber tire skidders was most appropriate in areas of difficult terrain or where the logging volume was smaller.

48. While logging may require the capital equipment for 90 days, a further 60–90 days of work can often be found for the equipment in construction, mining, or another complementary activity, and the equipment can be put to use in the mill yard, during the sawing period, for transporting logs to the infeed, and for clearing the yard. This would provide a total use of 180–200 days /yr. Specialized equipment such as delimbers may be available for only 60–90 days/yr and this would be a much less productive use of the capital equipment.

49. Peschke (1986:71) recognized the cost disadvantages to individual operators inherent in using mechanized equipment, and he suggested that a co-operative program be established whereby forestry firms joint venture with firms in complementary industries, such as mining and construction, to purchase new equipment that can improve efficiency. He suggested that industry spend approximately \$280 000 in new capital equipment that would be used for faster forest harvesting.

While the co-operative concept is reasonable in theory, the location and small size of most operations appears to make the suggestion unfeasible. There are several reasons why it would be difficult to implement such a scheme.

Co-operative equipment ventures are usually profitable if several operators exist in close proximity to each other and require the equipment in a non competing time frame. Most firms in Yukon harvest their wood in the winter over a 45-to 70-day period. This would bring intensive demands on the co-operative equipment during that time and virtually no demand for the remainder of the year.

Operating costs of the mechanized equipment would be high. In Yukon's forest industry most operators would require the mechanized equipment for less than a week at a time, and the mobilization and transportation costs to move the equipment to the geographically disperse operators quite possibly would offset the production advantages.

The mechanized equipment must be assured of reasonably constant use over several years. Given that production levels fluctuate dramatically in Yukon amongst small sawmill operators, the instability of production will increase risk and reduce the probability of success.

Finally, sawmills tend to substitute capital equipment for labour only when the cost of labour rises so high that the capital equipment is justified. In Yukon, local labour is usually available at prices that are substantially less than those in neighboring BC. With lower wages

levels and lower production levels, there is limited incentive to move to the more mechanized equipment.

50. Nagle *et al* (1987:19)

51. Ibid: 26.

52. Beaumont (1978: 65–135)

53. Primary breakdown is the initial manufacturing phase where the entire log is cut into a basic cant or thick slabs. Secondary breakdown is the secondary stage where the primary products are then re–sawn into basic dimensional lumber products of various thicknesses, widths, and lengths.

54. The authors who have conducted these studies are referenced in the bibliography and include: Dobie (1973), Mead (1964 and 1966), Phillips *et al.* (1973), Reed and Assoc. (1973), Beaumont (1978), Banskota (1984), and Haid (1986).

55. The lumber recovery factor (LRF) compares the volume of lumber recovered with the volume of logs processed through the mill. It is usually expressed as the amount in board feet of lumber in output derived from each cubic meter of log of input.

56. The size of the kerf is not solely dependent on saw thickness. The type of saw used, its sharpness, and a number of other factors all contribute to the size of kerf. But the overriding determinant of kerf is saw thickness. In addition, since the market for residue in the Yukon is almost zero, any reduction in the kerf results in less waste and a much higher value from each log.

57. The 2000 logs represent 32 000 lineal feet. The reduction in kerf by 0.1875 inches means that for each log 0.1875 inches of wood that was previously wasted is now converted to lumber. This yields 6000 fbm of additional lumber (32 000 X 0.1875).

58. Giles *et al* (1986a: II–24)

59. Peschke (1986: 92–104)

60. Peschke (1986: 67)

61. Woodland Resource Services Ltd. (1985: 32)

62. Beaumont (1978) and others concluded from their research that small operators who purchase new equipment take on financing costs that they have not had before, and unless they increase production levels often find that the declines in operating costs do not offset the financing charges. As such, the firms may buy new technology and become less competitive.

63. Manecon Partnership(1984) in a wood conversion study for Rae Edzo, NWT indicted that the cost to chip and deliver wood residues would be about $26.92/ cord based upon a 2 000 cord /yr operation and capital costs would be about $22 800 for the chipping equipment. If one assumed a 25% markup to cover any additional expenses and a return on investment it would mean a selling price of $33.65 per cord.

64. Deloitte, Haskins and Sells Associates, (1986) Exhibits 1–3 of viability section.

65. Peschke (1986: 9)

66. The present regulations governing tenure under the Territorial Lands Act do allow for the signing of multi-year timber harvesting agreements. Prior to 1972, there were five such agreements with operators in Watson Lake and Whitehorse. However, after that time only Yukon Forest Products and its heirs have held such an agreement. In recent years, local forestry officials in the Yukon have attempted to extend tenure lengths, and firms have been granted assured access to two to three years of timber. However, most banking officials feel that tenure of a minimum five years is the absolute lowest acceptable period.

67. Many of those interviewed had stories to illustrate their concerns regarding regulations, but there are two illustrative cases. In case one, the lack of a forest inventory and AAC guidelines meant that the individual operator was required to find appropriate timber supplies and request those areas from the local resource officer. The individual spends several thousand dollars locating a reasonable site and approaches forestry. The officer indicates that he does not feel that their is sufficient harvestable material to economically meet the needs of the company and turns down the application for the property. In case two, the individual requests a commercial fuelwood lot and is provided with one that is a significant distance to town. On his way to the site he passes by another operator and asks him for whom he is cutting wood. The individual replies that he has acquired a commercial permit and a commercial lot so that he can have an assured supply of fuelwood for his own personal private use and not for resale.

68. MacTavish and Dendron Resource Surveys Ltd. (1982: 1–10)

The main conclusions of his report were that:

1. Northern Affairs had a clear mandate to undertake forest management but no specific policies for implementing that mandate.

2. There was no integrated forest management program, only a set of activities with differing priorities. The lack of this management regime has wasted public funds and discouraged development of the forest industry and multiple use of forest land.

3. The Territorial Lands Act was only able to regulate timber cutting and had virtually no control over other aspects of forest management.

4. The annual cutting permits imposed restrictions that inhibited industrial development.

5. The Territorial Lands Act provides for the signing of Timber Harvesting Agreements, and the department should make more use of these agreements for forest operators.

6. Northern Affairs was seriously underfunded in

its ability to provide proper forest management and the stumpage system was inadequate.

7. The forest inventory data and understanding of growth capability was entirely inadequate. As expected, Mr. MacTavish recommended a program to establish forest policy and new regulations, negotiate more timber harvesting agreements, provide more funds for forest management, increase revenues, and modify the Territorial Lands Act to allow for greater authority to undertake forest management in the territory.

69. The National Building Code specifies that lumber used in home construction must be surface dried and contain no more than 15% moisture. As well, there are rules with respect to the number and size of knots. There is no rule that requires that the materials be kiln-dried.

70. Small operators had been concerned about the monopoly control of Hyland's predecessor, Yukon Forest Products. However, Yukon Forest Products used outmoded equipment and had poor management so production costs tended to be, equal to, or greater than, the smaller firms. Hence, the smaller firms were able to compete despite the disadvantage of their small size. A new modern firm would be a different situation entirely.

71. The greatest potential problem lies with the fact that senior officials in the Yukon Government who are directly responsible for granting financial assistance to small forest operators, also sit on the board of directors of Hyland Forest Products. This situation creates the potential for conflict of interest in the forest industry.

LITERATURE CITED

Banskota, K. 1984. An economic analysis of the production structure of the sawmilling industry in Alberta. Dept. of Rural Econ., Univ. of Alta, Edmonton, Alta., unpubl. thesis.

Beaumont, R.W. 1978. The economies of small scale sawmilling in the Peace River Region of B.C. Faculty of Graduate Studies, Univ. of B.C., Vancouver, B.C., unpubl. thesis.

Berton, P. 1958. Klondike fever. McClelland and Stewart Ltd., Toronto.

Bickerstaff, A. and T.G. Honer. 1985. Canada's forest area and wood volume balance, 1971–1981. Environ. Can., Can. For. Serv., Info. Rep. BC–X–272.

Bohning, R.A. 1986. The forest industry in the economy of the northwest territories, 1980–81. Environ. Can., Can. For. Serv., Info. Rep. NOR–X–277.

Campbell, N. 1987. Mill modernization under study. The Whitehorse Star, May 25, 1987, p. 3.

Cory, W.W. 1915. Report of the Mining Lands and Yukon Branch, In: Annual Report of the Canada Department of the Interior, 1914–15. Ottawa.

Deloitte, Haskins and Sells Associates. 1986. Report on the Watson Lake sawmill viability study. Yukon Dep. of Econ. Dev., Whitehorse.

Deneki Corporation. 1986. Preliminary feasibility study of a glue laminated manufacturing plant in the Yukon Territory. Yukon Dept of Econ. Dev. Whitehorse.

Dobie, J. 1973. Economies of scale in sawmilling in British Columbia. For. Chron. xx:79–82.

Ference, D. and Associates Ltd. 1987. Renewable resource development subsidiary agreement–decision guidelines. NWT Dep. of Ren. Res.

Giles, D., J.R.T. Hailey, and D.A. Mayer. 1986a. Survey of size, structure and socio–economic impact of wood using industries in Manitoba, 1985. Environ. Can., Can. For. Serv., and Man. Dep. Nat. Res.

Giles, D., J.R.T. Hailey, and D.A. Mayer. 1986b. Survey of size, structure and socio–economic impact of wood using industries in Saskatchewan, 1985. Environ. Can., Can. For. Serv. and Man. Dep. of Nat. Res.

Haid, D. 1986. An econometric analysis of logging in Alberta. Fac. Grad. Stud. and Res., Univ. of Alta, unpubl. thesis.

Heartwell, C.R. 1987. Markets for Yukon forest products. Environ. Can., Can. For. Serv, the Yukon Dep. of Econ. Dev. and Ren. Res., and Can. Dep. Ind. Aff. and North. Develop., in press.

HLA Consultants. 1986. Yukon based furniture manufacturing. Yukon Dept. of Econ. Dev. Whitehorse.

Jacques, R. 1988. Impact of forestry activity on the economy of Canada and its provinces: an input–output approach. Environ. Can., Can. For. Serv., Inf. Rep. E–X–39.

Knowler, D. 1987. Yukon economic development perspective update 1981–1985. Yukon Econ. Dev. and Can. Dep. Ind. Aff. and North. Develop., Whitehorse.

Loeks, D. (Sundog Resource Consulting). 1986. Feasibility study for introducing a fuelwood processor and a packaged delivery system into the Whitehorse region. Can. Dept. of Reg. Ind. Exp., Whitehorse, Yukon.

Manecon Partnership. 1984. Rae–Edzo community wood heating conversion study. Incorporated Hamlet of Rae–Edzo, unpubl. report.

MacTavish, J. and Dendron Resource Surveys Ltd. 1982. An evalution of the Northern Affairs forest management program. Can. Dept. Ind. Aff. and North. Develop.

Mead, W.J. 1964. Mergers and economic concentration in the Douglas–fir lumber industry. U.S. Dept. Agr., For. Serv., Res. Pap. PNW–9.Corvallis, Oreg.

Mead, W.J. 1966. Competition and oligopsony in the Douglas–fir lumber industry. Univ. Cal. Press, Berkley and Los Angeles.

Merrill, D.F. 1963. Forestry in the Yukon Territory. Can. Dept. Nor. Aff. and Nat. Res., Whitehorse, file report.

Nagle, G.S. 1980. Analysis of salvage yarding systems

and costs in Pacific coast forests. Environ. Can., Can. For. Serv., Inf. Rep. BC–X–214.

Nagle, G.S., M.R.C. Massie, G. Robinson, P. Oakley, and G.H. Manning. 1987. The economics of residual fuel and fibre production on the B.C. coast. Environ. Can. Can. For. Serv., Inf. Rep. BC–X–289.

Ondro, W.J. and T.B. Williamson. 1982. The forest industry in the economy of Alberta, 1979–80. Environ. Can., Can. For. Serv., Inf. Rep. NOR–X–246.

_____. 1984. The forest industry in the economy of Manitoba, 1979–80. Environ. Can., Can. For. Serv., Inf. Rep. NOR–X–263.

_____. 1985. The forest industry in the economy of Saskatchewan, 1979–80. Environ. Can., Can. For. Serv., Inf. Rep. NOR–X–270.

Oswald, E.T. and J.P. Senyk. 1977. Ecoregions of Yukon Territory. Environ. Can., Can. For. Serv., Info. Rep. BC–X–164.

Peschke, F. 1986. Yukon forest industry development study. Yukon Forest Industry Association, Whitehorse, Yukon.

Phillips, Barrett, Hillier, Jones and Partners. 1973. General report on the economics of commercially viable sawmills in the province of B.C. Report No. 1, Vancouver, B.C.

Price Waterhouse Ltd. 1986. A letter to the B.C. Council of Forest Industries. Vancouver.

Reed, F.L.C. and Associates Ltd. 1973. The British Columbia forest industry: its direct and indirect impact on the economy. B.C. Dept. of Lands, For. and Water Res., Victoria, B.C.

Robinson, J.L. 1945. Agriculture and forests of the Yukon Territory. Can. Geo. J., August, 1945.

Roche, W.J. 1916. The Yukon Territory: its history and resources. Can. Dep. Int., Ottawa.

Rowe, J.S. 1972. Forest regions of Canada. Dept. Env., Can. For. Serv., Pub. No. 1300.

Springate, N. and Associates. 1979. Northern markets for kiln dried lumber. Vancouver, B.C.

Tait, D. 1980. Watson Lake mill taken over by parent. The Whitehorse Star, Whitehorse, Yukon, January 17, 1980.

Woodland Resource Services Ltd. 1985. Feasibility study for lumber drying facility for Patterson Enterprise's sawmill, Hay River, N.W.T. Prepared for Patterson Enterprise's Ltd., Edmonton, Alberta.

Yukon Bureau of Statistics. various issues 1981–1987. Statistical review. Whitehorse, Yukon.

APPENDIX I

The Yukon Forest Industry Survey

The purpose of this study was to present a concise history of the forest industry in the Yukon, to describe the economic structure of the forest industry in Yukon, outline the impediments to further forest development, and to consider the competitiveness of the industry. In some cases information on some parts of the forest industry were available from the Whitehorse office of the Forest Resources Division of Northern Affairs–DIAND(Yukon). However, in many areas, particularly for the sawmill industry, information was not readily available. As such, a forest industry survey was conducted in the Yukon.

The Yukon forest industry survey attempted to conduct a detailed survey of every active sawmill in the territory and to contact a variety of operators in the other sectors in order to obtain information to confirm data held by government agencies. The population of firms to be covered in the research was derived from a variety of sources including the Yukon Business Directory and registry, the Northwest Tel telephone book, government permits, and newspaper classified advertisements. A complete list of the firms was prepared and is included in Appendix III of the report.

The focus of the data requirements for the industry were in the sawmilling area and to this end a detailed questionnaire was prepared for sawmill operators. The questionnaire was circulated to the technical committee overseeing this study for comment and approval. A more modest questionnaire was developed for the other sectors. The main questionnaire is included in Appendix IV of the report.

In total, 31 sawmills were identified as existing in the Yukon. Of this total, three left the territory in 1986/87, a further 3 were used exclusively for hobby use, 2 were purchased in 1986/87 but never used, and 6 longer-term operators did not operate their mills during the 1986/87 year. This left a total of 17 firms who actually produced some product during the year. The period of June 1986 to June 1987 was chosen as it seemed to come the closest to approximating the forest season.

Letters were sent to 23 operators soliciting their input and assistance. In turn, each firm was contacted and attempts made to interview the owners personally, at which time the information was solicited. In total, information was obtained from 15 of the 17 actively operating firms and 3 of the 6 regularly operating firms who had no production in 1986/87. Operators easily outlined the basic information on ownership, equipment, production levels, products, and markets. Reports, studies, and files held by the local forestry office also provided supporting information to that outlined by the operators themselves.

Detailed information on production costs were more difficult to obtain. Every operator appeared to have a firm idea of the total costs of logging and sawmill production but could not provide detailed breakdowns. However, six firms did have sufficient data to make the breakdowns, and data from the Deloitte, Haskins and Sells report on the Hyland Forest Products mill was used to add a seventh firm. In addition, Statistics Canada publication 25–204 had production data on four northern sawmill firms for selected years from 1972–1984. The most recent data from this data set was used to help verify the percentage distribution of costs between the various elements.

Most sawmill operators are integrated logging/sawmilling businesses, and the interviews of the sawmill firms provided a great deal of the basic information on the logging sector. In addition, selected independent loggers were contacted and interviewed. Further information was obtained from the local forest resources office, the Deloitte, Haskins and Sells report, and the actual results of the first logging contract with Hyland Forest Products.

For the fuelwood and houselog sector, attempts were made to contact operators by telephone but many firms did not respond. However, a good quantity of information was made available from DIAND records, conversations with government officials, and recent reports on the fuelwood industry, and it was this information that was used in large part to prepare the report. In addition, those fuelwood operators contacted provided additional information.

In the pine seed sector, conversations were held with each of the cone buyers to determine information, and conversations were held with the major cone producers in the Yukon.

The questionnaire data were summarized and totalled, and the tables presented in this report are largely drawn from these summaries. The questionnaires themselves were designed to be consistent with similar surveys conducted by the Canadian Forestry Service in 1986 in Saskatchewan, Manitoba, and Alberta in order to provide consistency and completeness in the comparative analysis. The response rate for the logging/sawmilling sectors were extremely high and the data quality was above average for a survey of this type. The response rates for the other sectors were not as complete, but there was more available written information from files and recent studies that was used to obtain the necessary data.

APPENDIX II DETAILED TABLES

Appendix II–1. Yukon Forest Industry Production from 1900/01–1986/87

Year	Lumber		Cordwood		Houselogs		Total	Pine seed	Pines cones
	M fbm	m^3	cords	m^3	Mlin.ft	m^3	m^3	Kg	Hl
1900/01	0.0	0.0	69 483.5	157 359.2	26.7	151.2	157 510.5	0.0	0.0
1901/02	0.0	0.0	23 166.0	52 464.0	30.1	170.1	52 634.2	0.0	0.0
1902/03	0.0	0.0	23 166.0	52 464.0	30.1	170.1	52 634.2	0.0	0.0
1903/04	0.0	0.0	22 832.0	51 707.6	9.1	51.5	51 759.1	0.0	0.0
1904/05	35.0	198.2	22 832.0	51 707.6	9.1	51.5	51 957.3	0.0	0.0
1905/06	210.0	1189.0	11 593.0	26 254.7	7.0	39.6	27 483.3	0.0	0.0
1906/07	155.0	877.6	12 674.0	28 702.8	8.3	46.7	29 627.1	0.0	0.0
1907/08	244.0	1381.5	9068.0	20 536.3	0.0	0.0	21 917.8	0.0	0.0
1908/09	na	na	na	na	na	na	na	0.0	0.0
1909/10	na	na	na	na	na	na	na	0.0	0.0
1910/11	na	na	na	na	na	na	na	0.0	0.0
1911/12	na	na	na	na	na	na	na	0.0	0.0
1912/13	na	na	na	na	na	na	na	0.0	0.0
1913/14	na	na	na	na	na	na	na	0.0	0.0
1914/15	531.4	3008.8	21 661.0	49 055.7	2.8	15.8	52 080.3	0.0	0.0
1915/16	1609.5	9112.9	13 786.5	31 222.3	2.0	11.3	40 346.5	0.0	0.0
1916/17	477.9	2705.9	23 074.5	52 256.8	0.0	0.0	54 962.7	0.0	0.0
1917/18	na	na	na	na	na	na	na	0.0	0.0
1918/19	510.0	2887.6	22 087.5	50 021.6	0.0	0.0	52 909.2	0.0	0.0
1919/20	0.9	5.1	13 107.9	29 685.5	0.0	0.0	29 690.6	0.0	0.0
1920/21	16.4	92.9	16 099.5	36 460.5	0.0	0.0	36 553.4	0.0	0.0
1921/22	na	na	na	na	na	na	na	0.0	0.0
1922/23	544.2	3081.3	20 282.0	45 932.6	54.9	310.6	49 324.5	0.0	0.0
1923/24	364.7	2064.9	16 447.8	37 249.2	0.0	0.0	39 314.2	0.0	0.0
1924/25	258.9	1465.9	11 344.4	25 691.6	0.0	0.0	27 157.5	0.0	0.0
1925/26	1250.0	7077.5	10 738.5	24 319.5	0.0	0.0	31 397.0	0.0	0.0
1926/27	137.1	776.3	14 051.8	31 823.0	0.0	0.0	32 599.3	0.0	0.0
1927/28	155.7	881.6	9139.0	20 697.1	0.0	0.0	21 578.7	0.0	0.0
1928/29	152.2	861.8	16 603.0	37 600.8	0.0	0.0	38 462.6	0.0	0.0
1929/30	105.9	599.6	15 991.8	36 216.5	0.4	2.2	36 818.3	0.0	0.0
1930/31	0.0	0.0	15 300.0	34 649.9	0.0	0.0	34 649.9	0.0	0.0
1931/32	0.0	0.0	9589.5	21 717.3	0.0	0.0	21 717.3	0.0	0.0
1932/33	0.0	0.0	8475.0	19 193.3	0.0	0.0	19 193.3	0.0	0.0
1933/34	0.0	0.0	7050.5	15 967.3	0.0	0.0	15 967.3	0.0	0.0
1934/35	67.0	379.4	9739.0	22 055.9	0.0	0.0	22 435.3	0.0	0.0
1935/36	185.0	1047.5	11 946.0	27 054.1	0.0	0.0	28 101.6	0.0	0.0
1936/37	483.8	2739.3	16 401.0	37 143.3	0.0	0.0	39 882.6	0.0	0.0
1937/38	400.0	2264.8	19 677.0	44 562.5	0.0	0.0	46 827.3	0.0	0.0
1938/39	671.6	3802.6	17 888.0	40 511.0	0.0	0.0	44 313.6	0.0	0.0
1939/40	351.2	1988.5	15 387.0	34 846.9	0.0	0.0	36 835.4	0.0	0.0
1940/41	306.0	1732.6	19 531.0	44 231.9	0.0	0.0	45 964.4	0.0	0.0
1941/42	300.0	1698.6	12 847.0	29 094.6	0.0	0.0	30 793.2	0.0	0.0
1942/43	1305.0	7388.9	13 658.0	30 931.3	0.0	0.0	38 320.2	0.0	0.0
1943/44	15 909.1	90 077.3	69 759.0	157 983.2	681.1	3499.8	251 560.3	0.0	0.0
1944/45	6607.2	37 410.0	23 567.0	53 372.2	0.0	0.0	90 782.2	0.0	0.0
1945/46	953.7	5399.8	11 008.0	24 929.8	0.0	0.0	30 329.7	0.0	0.0
1946/47	2539.5	14 378.6	14 379.0	32 564.1	0.0	0.0	46 942.8	0.0	0.0
1947/48	2446.5	13 851.9	20 837.5	47 190.7	2.0	11.3	61 053.9	0.0	0.0
1948/49	389.2	2203.4	26 071.0	59 043.0	48.8	276.4	61 522.8	0.0	0.0
1949/50	1692.7	9584.0	2097.0	4749.1	117.6	666.0	14 999.1	0.0	0.0

Appendix II–1 – Cont'd

Year	Lumber		Cordwood		Houselogs		Total	Pine seed	Pine cones
	M fbm	m³	cords	m³	Mlin.ft	m³	m³	Kg	Hl
1950/51	1291.0	7309.6	16 003.0	36 242.0	985.7	5581.0	49 132.7	0.0	0.0
1951/52	6183.0	31 832.3	12 629.0	30 416.3	1075.0	6088.9	68 337.6	0.0	0.0
1952/53	4978.0	25 603.1	13 135.0	31 662.4	2027.0	11 498.2	68 790.7	0.0	0.0
1953/54	4117.0	21 183.0	8400.0	20 220.9	2392.0	13 537.2	54 941.9	0.0	0.0
1954/55	4426.0	23 307.8	7054.0	16 964.0	1834.0	10 393.7	50 665.5	0.0	0.0
1955/56	2804.0	14 415.2	6171.0	14 868.3	949.0	538.1	29 821.6	0.0	0.0
1956/57	4893.0	2520.5	7748.0	18 663.3	2160.0	12 234.5	33 418.3	0.0	0.0
1957/58	3174.0	16 341.0	5544.0	13 339.0	1414.0	8014.7	37 694.7	0.0	0.0
1958/59	2678.0	13 792.1	5527.0	13 310.7	1175.0	6655.3	33 758.1	0.0	0.0
1959/60	4805.0	24 723.9	5418.0	13 055.8	1167.0	6598.7	44 378.4	0.0	0.0
1960/61	4038.0	20 589.1	6249.0	15 038.2	919.0	5211.0	40 838.3	0.0	0.0
1961/62	3822.0	198 682.6	4935.0	11 866.3	197.0	1104.5	32 653.6	0.0	0.0
1962/63	8092.0	42 716.2	6907.0	16 624.2	2103.0	11 923.0	70 263.4	0.0	0.0
1963/64	8999.0	46 360.8	5902.0	14 216.9	2723.0	15 434.7	76 012.5	0.0	0.0
1964/65	6558.0	33 786.5	8677.0	20 900.6	2309.0	13 084.1	67 771.2	0.0	0.0
1965/66	2654.0	13 650.5	6798.0	16 369.3	1198.0	6796.9	36 816.8	0.0	0.0
1966/67	5214.0	26 847.9	8411.0	20 249.2	1626.0	9204.2	56 301.3	0.0	0.0
1967/68	10 049.0	51 203.6	9399.0	22 628.2	612.0	3455.1	77 286.9	0.0	0.0
1968/69	7681.0	39 139.1	10 080.0	24 270.7	1151.0	6513.7	69 523.5	0.0	0.0
1969/70	12 058.0	61 455.7	6084.0	14 641.7	651.0	3681.7	79 779.1	0.0	0.0
1970/71	5459.0	30 926.1	5487.0	13 197.4	710.0	4927.8	49 051.3	0.0	0.0
1971/72	4713.0	26 706.3	7449.0	17 926.4	933.0	5126.0	49 759.3	0.0	0.0
1972/73	7394.0	37 694.7	7719.0	18 578.3	568.0	3228.5	59 501.6	0.0	0.0
1973/74	15 193.0	77 456.8	7964.0	19 173.0	1612.0	9119.2	105 749.1	0.0	0.0
1974/75	13 061.0	66 581.7	9644.0	23 222.9	1950.0	11 045.0	100 849.6	0.0	0.0
1975/76	12 345.0	69 923.5	11 475.0	25 970.0	420.0	2378.9	98 272.4	0.0	0.0
1976/77	8322.0	47 125.5	11 178.0	25 318.6	505.0	2860.4	75 304.4	0.0	0.0
1977/78	16 404.0	92 919.9	9626.0	21 806.9	535.0	3030.3	117 757.0	57.0	259.1
1978/79	14 131.0	80 034.0	12 776.0	28 943.6	745.0	4219.8	113 197.4	299.0	1359.1
1979/80	20 440.0	115 633.0	17 432.0	39 478.9	715.0	4049.8	159 161.7	261.0	1186.3
1980/81	3251.0	18 408.4	13 695.0	31 011.0	655.0	3710.0	53 129.4	563.0	2559.1
1981/82	2511.3	14 225.0	18 215.8	41 249.6	957.4	5423.0	60 897.5	279.0	1268.2
1982/83	2437.3	13 806.0	39 434.4	89 299.0	553.6	3136.0	106 241.0	502.0	2281.8
1983/84	2359.6	13 366.0	32 741.8	74 143.6	793.0	4492.0	92 001.6	519.0	2359.1
1984/85	11 331.7	64 188.0	26 942.9	61 012.0	809.4	4585.0	129 785.0	608.0	2763.6
1985/86	5414.1	30 668.0	32 497.8	73 591.0	715.5	4053.0	108 312.0	525.0	2386.3
1986/87	6841.6	38 754.0	43 314.8	98 086.0	708.1	4011.0	140 851.0	484.0	2,200.0

Source: Canada, Department of Indian Affairs and Northern Development (DIAND) 1900/01–1949/50–Annual Department Reports, various 1950/51–1986/87–Northern Affairs–Yukon, yearly summary reports

Note: Data on the period 1900–1906 was very inaccurate as officials did not record lumber sawn from timber berths and vast quantities of lumber was sold illegally from mineral claims, without royalty being paid. Conversion rates are: 1 cord=2.2647 m³ and 1M fbm=5.662 m³ and 1 m³=.4416 cords and 1 m³=176.54 fbm 4.545 hl.=1kg of seed or 1kg. seed=0.22hl.

Appendix II–2. Prices for Yukon's forest products, 1960–1986

Year	Lumber (M fbm)	Cordwood (Cords)	Roundwood (Lineal Ft.)
1960	55.0	8.0	0.10
1961	55.0	8.0	0.10
1962	55.0	8.0	0.10
1963	60.0	12.0	0.10
1964	60.0	12.0	0.10
1965	70.0	16.0	0.10
1966	70.0	16.0	0.10
1967	80.0	20.0	0.10
1968	80.0	20.0	0.10
1969	80.0	20.0	0.10
1970	90.0	20.0	0.10
1971	90.0	19.0	0.10
1972	90.0	20.0	0.10
1973	150.0	20.0	0.15
1974	180.0	24.0	0.18
1975	225.0	27.5	0.50
1976	206.0	35.0	0.50
1977	230.0	40.0	0.50
1978	283.0	40.0	0.40
1979	280.0	40.0	0.40
1980	221.0	42.0	0.29
1981	194.0	42.0	0.31
1982	189.0	45.0	0.28
1983	200.0	60.0	0.30
1984	219.5	60.1	0.30
1985	219.0	69.4	0.30
1986	227.0	75.0	0.31
1987			
1988			

Source: DIAND–Yukon Forest Resources files, various years. Prices were determined from reports and letters sent by Yukon forestry officials to Ottawa. Prices are set at the price FOB Whitehorse and are in current dollars.

Appendix II–3. Yukon forest harvest by PRODUCT– 1974/75 – 1985/86

Year	Sawlog	Fuelwood	Fenceposts	Poles	Houselogs	Timbers	Total	Total	Pine Seeds (Kg)
			(Cubic meters)						
1974/75	73 959.0	21 846.0	113.0	150.0	2619.0	3401.0	6283.0	102 088.0	0.0
1975/76	67 536.0	25 966.0	96.0	385.0	2095.0	1356.0	3932.0	97 434.0	0.0
1976/77	46 932.0	25 162.0	0.0	510.0	1158.0	1305.0	2973.0	75 067.0	0.0
1977/78	92 024.0	22 076.0	190.0	700.0	1475.0	1223.0	3588.0	117 688.0	57.0
1978/79	80 012.0	29 492.0	331.0	275.0	1560.0	1529.0	3695.0	113 199.0	299.0
1979/80	114 485.0	39 757.0	379.0	0.0	818.0	2818.0	4015.0	158 257.0	261.0
1980/81	18 415.0	32 598.0	1212.0	197.0	1037.0	4168.0	6614.0	57 627.0	563.0
1981/82	10 736.0	39 335.0	1707.0	1512.0	1774.0	462.0	5455.0	55 526.0	279.0
1982/83	13 538.0	87 260.0	662.0	0.0	2366.0	0.0	3028.0	103 826.0	502.0
1983/84	13 366.0	75 546.0	1157.0	0.0	3292.0	0.0	4449.0	93 361.0	519.0
1984/85	24 560.0	60 973.0	680.0	44.0	2463.0	1365.0	4552.0	90 085.0	608.0
1985/86	26 811.0	73 623.0	928.0	0.0	2029.0	1092.0	4049.0	104 483.0	525.0

Source: Northern Affairs–DIAND (Ottawa)
Canadian Forestry Service – Pacific Forestry Centre (pine seeds)

Appendix II–4. Yukon forest harvest by region – 1980/81 – 1986/87

Year	Beaver Creek				Carmacks				Dawson City			
	Sawlogs	Fuelwood	Houselogs	Total	Sawlogs	Fuelwood	Houselogs	Total	Sawlogs	Fuelwood	Houselogs	Total
1980/81	1487.3	96.9	0.0	1584.2	2117.2	4529.4		6646.6	2777.9	1709.5		4487.4
1981/82	1553.0	507.5	0.0	2060.5	566.0	4672.5	275.0	5513.5	2001.0	2590.6	278.0	4869.6
1982/83	500.0	245.6	0.0	745.6	512.9	9035.1	240.2	9788.2	1692.6	3899.1	427.4	6019.1
1983/84	0.0	156.3	0.0	156.3	1460.0	5611.5	265.8	7337.3	2200.0	2126.9	495.4	4823.2
1984/85	0.0	117.5	0.0	117.5	736.0	3372.5	122.3	4230.8	2200.0	1911.4	288.6	4400.0
1985/86	1855.0	140.0	0.0	1995.0	2109.7	7595.0	432.0	10 136.7	5345.7	1419.0	23.0	6787.7
1986/87	na	na	na	na	na	na	na	na	na	na	na	na

	Haines Junction				Laberge				Mayo			
	Sawlogs	Fuelwood	Houselogs	Total	Sawlogs	Fuelwood	Houselogs	Total	Sawlogs	Fuelwood	Houselogs	Total
1980/81	34.0	1863.6		1897.6	766.0	13 154.7		13 920.7	2679.6	1396.3		4075.9
1981/82	151.0	2731.9	351.0	3233.9	2413.0	21 030.0	2668.0	26 111.0	1100.0	1741.9	894.0	3735.9
1982/83	0.0	3962.6	2527.0	6489.6	1179.3	55 784.5	932.1	57 895.9	180.0	1651.7	168.4	2000.1
1983/84	200.0	3747.0	443.1	4390.1	1649.0	49 287.4	1074.7	52 011.2	1872.0	1337.5	122.2	3331.7
1984/85	2578.0	3071.1	422.3	6071.4	2304.0	39 251.0	494.0	42 049.0	8756.0	1765.0	30 272.0	40 793.0
1985/86	0.0	4874.0	167.0	5041.0	2488.0	45 909.0	866.0	48 444.0	5045.0	1563.0	169.0	6777.0
1986/87	na	na	na	na	na	na	na	na	na	na	na	na

	Ross River				Tagish				Teslin			
	Sawlogs	Fuelwood	Houselogs	Total	Sawlogs	Fuelwood	Houselogs	Total	Sawlogs	Fuelwood	Houselogs	Total
1980/81	317.5	2329.9		2647.4	2990.0	4056.6		7046.6	1262.9	1216.4		2479.3
1981/82	520.0	651.3	20.0	1191.3	1645.0	4617.5	633.0	6895.5	2282.0	1665.0	207.0	4154.0
1982/83	510.0	1641.9	41.9	2193.8	3242.0	8088.4	806.7	12 137.1	1970.0	1725.0	111.1	3806.1
1983/84	0.0	1632.5	113.9	1746.0	4765.0	6121.6	1634.0	12 520.6	1220.0	1942.5	140.5	3303.0
1984/85	0.0	1556.9	37.1	1594.0	6986.0	7841.4	1755.2	16 582.6	1400.0	1296.3	15.1	2711.3
1985/86	0.0	708.0	36.0	744.0	4431.0	6656.0	783.0	11 870.0	350.0	2788.0	178.0	3316.0
1986/87	na	na	na	na	na	na	na	na	na	na	na	na

Appendix II–4 Cont'd

	Watson Lake				Total			
	Sawlogs	Fuelwood	Houselogs	Total	Sawlogs	Fuelwood	Houselogs	Total
1980/81	8168.2	675.0		8843.2	22 600.6	31 028.3	3698.8	57 327.7
1981/82	1994.0	1041.3	97.0	3132.3	14 225.0	41 249.5	5423.0	60 897.5
1982/83	4020.0	3265.0	383.5	7668.5	13 806.7	89 298.9	3136.3	106 241.9
1983/84	0.0	2179.4	202.7	2382.1	13 366.0	74 143.6	4492.2	92 001.8
1984/85	39 178.5	828.8	1419.7	41 426.9	64 188.5	61 011.8	4584.6	129 784.8
1985/86	9043.6	2758.0	1404.0	13 205.6	30 668.0	73 591.0	4058.0	108 317.0
1986/87	na	na	na	na	38 754.0	98 086.0	4011.0	140 851.0

Source: Forest Resources Division, DIAND – Yukon

APPENDIX III

LIST OF FOREST INDUSTRY FIRMS

LOGGING FIRMS, 1987

Richard Brais
Antique Logging and Contracting
1405 Fir Street
Whitehorse, Yukon
Y1A 4C5

Ron Rogers
Colorado Resources Inc.
Box 142
Watson Lake, Yukon
Y0A 1CO
403-536-2421

Tony Buerge
Full Scale Logging
Box 4747
Whitehorse, Yukon
Y1A 4N6

Joseph Enterprises
30 Balsam Crescent
Whitehorse, Yukon
Y1A 4V7

Dixon Lutz
Dachin Degeh/Liard Logging
Box 123
Watson Lake, Yukon
Y0A 1C0
403–536–2326

Roger Reams
The North Contracting Ltd.
Box 353
Watson Lake, Yukon
Y0A 1C0
403–536–7319

Sam Brennan
North Pine Enterprises
Box 4145
Whitehorse, Yukon
Y1A 3S9

Frank Fairclough
Sourdough Logging
Box 4924
Whitehorse, Yukon
Y1A 4S2
403–633–6542

Russell Sam
Box 4365
Whitehorse, Yukon
Y1A 3T6

Champagne Indian Band
101–307 Jarvis Street
Whitehorse, Yukon
Y1A 2H3
403–634–2288

Bruce Harder
B and D Logging
Box 129
Carcross, Yukon
Y0B 1B0

Dan Budd
21 Sunset Dr. N.
Whitehorse, Yukon
Y1A 4M7
403–668–7575

Gerry Wigrin/Kevin Newfeld
Aurora Timber
General Delivery
Whitehorse, Yukon
Y1A 2B0
403–633–5165

George Garret
GG Logging and Firewood
1410 Fir St.
Whitehorse, Yukon
Y1A 4C6
403–633–2202

Listed in 1985/85 but not 86/87
Teslin Indian Band
Teslin Indian Band Slashing Ltd.
General Delivery
Teslin, Yukon
Y0A 1B0
403–390–2532

CONE PICKERS

Tom Walton or John Wright
Ah–Tigh–More Enterprises
Box 4986
Whitehorse, Yukon
Y1A 4S2
403–668–1083
Don Knight
Yukon Timber Resources
114 Silver Road
Whitehorse, Yukon
Y1A 2V7
Tom Cove
Mayo Forest Products
20 Sunset Drive N.
Whitehorse, Yukon
Y1A 4M7
403–668–6374
Harry McGinty
McGinty Cone Picking
General Delivery
Mayo, Yukon
Y0B 1M0
403–996–2567
Frank Fairclough
Sourdough Logging
Box 4924
Whitehorse, Yukon
Y1A 4S2

SAWN LUMBER MANUFACTURERS

W.B. (Bill) Bowie
Arctic Inland Resources
Box 105
Dawson City, Yukon
Y0B 1G0
403–993–5240

Brandy Greenwood
Teslin Forest Products
General Delivery
Teslin, Yukon
Y0A 1B0
2M–3259 JR Channel

Con Klippert
C and I Construction
Box 134
Mayo, Yukon
Y0B 1M0
403–996–2272

Cal Lindstrom
Cal's Trucking
Box 280
Mayo, Yukon
Y0B 1M0
403–996–2221

Ernest Smith
Ernie's Sawmill Ltd.
Box 5028
Whitehorse, Yukon
Y1A 4S5
403–667–7158/Telex: Or668–3853

John Ewing
Ewing Transport
Box 61
Mayo, Yukon
Y0B 1M0
403–996–2278

Fred Hemains
Fred's Sawmill
Box 5214
Whitehorse, Yukon
Y1A 4Z1
403–6681–1050

John and Netta Derosier
Frontier Lumber
Box 382
Watson Lake, Yukon
Y0A 1C0
2M–5113 W.L.Ch., H459 659 WL Ch

Yukon Wood Services
J. Gilbert/N. Hnatuk
Box 4014
Whitehorse, Yukon
Y1A 3S9

Gunnar Nilsson
Sloughmill
Box 4646
Whitehorse, Yukon
Y1A 3V7
YJ3–6552 YL,YJ,YS,YR channels between 5 and 6

Jack Sigalet
Hyland Forest Products
Box 183
Watson Lake, Yukon
Y0A 1C0
403–536–2472

Beat Ledergerber
Ledergerber Lumber
General Delivery
Beaver Creek, Yukon
Y0B 1A0
403–862–7403

Vern Paylor
K.V. Sawmills
Box 4699
Whitehorse, Yukon
Y1A 3V7
YS Channel 2M5196

M.D'Agnolo
MAK Forest Products Ltd.
803 Wheeler Street
Whitehorse, Yukon
Y1A 2P8
403–668–3165

Helmut Klinkicht
Prophet River Spruce
12580–243 St.
Maple Ridge, B.C.
V2X 7Z4
604–463–4045 or c/o Marvin Ramus
JJ3512
Pointed Mtn Channel–12–1 or 6–7

H.R. Kneller
Rogers Resources
Box 4061
Whitehorse, Yukon
Y1A 3S9
Y73- 9382

Dave Harder
Ten Mile Logging
Box 4700
Whitehorse, Yukon
Y1A 3V7
403–668–6938

Ron Foos/Clyde Courser
Koinonia Forest Products
Mile 10 Mayo Road
Whitehorse, Yukon
Y1A 3V7
403–633–5725

Boyd Campbell
Wild Mountain Thyme
Box 5357
Haines Junction, Yukon
Y0B 1L0
403–634–2518

J. Gilbert/N. Hnatuk
Yukon Wood Services
Site 20, Comp 85 RR 1
Whitehorse, Yukon
Y1A 4Z6

Joe Schinkel
Schinkel's Mill
Tagish Road
Carcross, Yukon
Y0B 1B0
c/o Carcross Band at 821–4251

Don Lange
Lange Custom Sawing
R.R. #2 Hotsprings Road
Whitehorse, Yukon
Y1A 5A5
403–633–3748
Omar Peel
Star Ranch
Marsh Lake, Yukon

D. McIlmoyle/Ron Rogers
Ptarmigan Timber Ltd.
Box 384
Watson Lake
Y0A 1B0
403–536–7756

Aurora Timber
J. Wigrin/K. Neufeld
Whitehorse, Yukon
403–633–5165
Old Crow Band
Old Crow Co–op Sawmill
General Delivery
Old Crow, Yukon
Y0A 1N0
403–966–3011

Charlie James
Carcross Band Sawmill
Box 130
Carcross, Yukon
Y0B 1B0
403–821–4251

FIREWOOD PRODUCERS

ACTIVE IN 1986/87

Dennis Thiboudeau
Amada Woodcutting Services
4051–4th Ave.
Whitehorse, Yukon
Y1A 1H1

Steven Anderson
Anderson and Sons Contracting
Box 5258
Whitehorse, Yukon
Y1A 4S3

Fred Andre
Andre's Firewood
505 Hanson Street
Whitehorse, Yukon
Y1A 1Y9

Lesa Maloney and
Simone Tottenham
Beaver Woodcutting Services
General Delivery
Ross River
Y0B 1S0

Bill Glover
Bill Glover Firewood Sales
28 Beech St.
Whitehorse, Yukon
Y1A 4A6

Boro's Woodcutting
504 Strickland St.
Whitehorse, Yukon
Y1A 2K5

David Doris
D and J Woodcutting
Box 591
Faro, Yukon
Y0B 1K0

Rick James–Davies
Davies Wood
Site 5 Comp 47, RR 2
Whitehorse, Yukon
Y1A 5A5

Don Parent Jr.
Future Enterprises
Box 5306
Whitehorse, Yukon
Y1A 4S3

Ivan Campen
H and I Wood Service
General Delivery
Whitehorse, Yukon
Y1A 2B0

James and Patricia Cooley
J and P Wood Services
Box 5419
Whitehorse, Yukon
Y1A 4Z2

Brian Ross
Lakeside Wood Industries
Box 4146
Whitehorse, Yukon
Y1A 3T3

Debbie Loblaw
Lo–Cost Wood Products
Box 88
Faro, Yukon
Y0B 1K0

Mario D'Agnolo
MAK Forest Products
803 Wheeler Street
Whitehorse, Yukon
Y1A 2P8

Craig L. Davies
Mountain Cordwood
Site 19 Comp 7 RR2
Whitehorse, Yukon
Y1A 5A5

Malcolm Smith
O.K. Cordwood
29 Oak Street
Whitehorse, Yukon
Y1A 4A9

Brian Charles
Pilgrims Firewood Service
28 Beech St.
Whitehorse, Yukon
Y1A 4A6

R. Lapensee
Richards Heating Service
12–918.3 Alaska Highway
Whitehorse, Yukon
Y1A 4S8

Ian Boyd
Sam Magees Firewood Ltd.
General Delivery
Whitehorse, Yukon
Y1A 2B0

Sterling Maxfield
Sawdust Enterprises
Box 4145
Whitehorse, Yukon
Y1A 3T1

Terry and Ruth Stuart
Stuart Transfer–1984
Box 4605
Whitehorse, Yukon
Y1A 2R8

Frank Leaman
Vals Firewood
Site 16 Comp 34 RR 1
Whitehorse, Yukon
Y1A 4Z6

Frank Delaplain
Woodstock Deliveries
Site 15 Comp 26 RR2
Whitehorse, Yukon
Y1A 5A5

N. Hnatuk
Yukon Wood Services
Site 20 Comp85 RR1
Whitehorse, Yukon
Y1A 4Z6

Paul Duquette
10–20 Wood Service
2007 Centennial St.
Whitehorse, Yukon
Y1A 3Z6

NOT ACTIVE IN 1986/87

W. Paquet
Paquet Wood Splitting
17 Takhini Ave.
Whitehorse, Yukon
Y1A 3M3

Peter Krywicki
53–178 Range Rd.
Whitehorse, Yukon
Y1A 4V1

Shirleen Hauser
Takhini Firewood Service
1106 Holly St.
Whitehorse, Yukon
Y1A 4E5

G and T Wood Services
General Delivery
Ross River, Yukon
Y0B 1S0

Jack's Firewood
802 Wheeler Street
Whitehorse, Yukon
Y1A 2P9

ROUNDLOG OPERATORS

Kristin Innes–Taylor and
Larry Lebedoff
Discovery Log
Construction 909 Alaska Highway
Whitehorse, Yukon
Y1A 4S8
403–668–2414

Fred Fisher
Site 15 Comp 65 RR2
Whitehorse, Yukon
Y1A 5A5

Dana Basarab
Klondike Cabins Ltd.
Box 266
Watson Lake, Yukon
Y0A 1C0
403–536–2616

J.D. Mikkelson
J.D. Mikkelsen Contracting
General Delivery
Whitehorse, Yukon
Y1A 4N1

Gerry Peters
Yukon Log Craft
Box 87
Mayo, Yukon
Y0B 1M0
403–996–2251

Dennis Klein
5 Roundel Road
Whitehorse, Yukon
Y1A 3H3
403–668–4709

WOOD MANUFACTURING

Pat Hogan
Broadaxe Enterprises Ltd.
Box 627
Dawson City, Yukon
Y0B 1G0
403–993–5465

Doug Rode
Darcraft Cabinets and Millwork
Box 4984
Whitehorse, Yukon
Y1A 4S2
403–668–6289

David Kalles
Kalles Cabinet and Construction Ltd.
Box 201
Watson Lake, Yukon
Y0A 1C0
403–536–7417

Kip Boyd
Kilrich Industries Ltd.
Box 4997
Whitehorse, Yukon
Y1A 4S2
403–668–5958

Ted Wagner
Margsted Corporation
Box 4676
Whitehorse, Yukon
Y1A 3V7
403–668–2971

George Moore
Polar Industries
117 Copper Rd.
Whitehorse, Yukon
Y1A 2Z7
403–667–7332

Teslin Tlingit Woodcrafts
General Delivery
Teslin, Yukon
Y0A 1B0

Eric Winzer
Winzer Woodworks
Box 4873
Whitehorse, Yukon
Y1A 4N6
403–667–6584

Richard Law
Woodpecker Woodworking
Box 4831
Whitehorse, Yukon
Y1A 4N6
403–668–6289

Michael Singer
Wooden Joint Manufacturing Co.
Box 4905
Whitehorse, Yukon
Y1A 4S2
403–668–3378

Brian Huber
B and C Woodworks
Box 5334
Whitehorse, Yukon
Y1A 4Z2

Chris Cormier
Classic Designs
7213–7th Ave.
Whitehorse, Yukon
Y1A 1R6

Mervin Lien
Mens Furniture and Cabinet Shop
605 Ray Street
Whitehorse, Yukon
Y1A 2T4

APPENDIX IV

SURVEY QUESTIONNAIRE
FOR
SAWN LUMBER MANUFACTURERS

April 1987

YUKON FOREST INDUSTRY SURVEY

Yukon Government/Northern Affairs/
Yukon Forest Industry Association

Interviewer's Name: _____

Date: _____ ID#_____

1.0 GENERAL INFORMATION

1.1 Kind of Manufacturing Facility: Sawmill Sawmill/Planer
Planer Other

1.2 Name and Address of Plant:

_____

_____

_____

Telephone: _____ Postal Code: _____

1.3 Name of Person to Contact: _____
Position: _____
Data provided is based on:
- Fiscal Year 86/87 Calendar Year 1986
- If Fiscal Year - Year End Date: _____

1.4 (a) Type of Ownership:
Limited liability/incorporated
Crown corporation
Partnership
Single Proprietorship
Other

(b) Length of Ownership:

Year established: _____

Number of years of current ownership: _____

Number of years mill at current site (including previous ownership): _____

(c) What is the principle occupation of the firm's owners?

Logging _____

Sawmilling _____

Transportation _____

Construction _____

Farming/ranching _____

Other (specify) _____

(d) Percentage of income derived from forestry by the firm:

0 - 24% _____

25 - 44% _____

50 - 74% _____

75 - 100% _____

1.5 Mill is - Stationary Portable

1.6 Last year operated _____

1.7 Rated capacity

(a) Rated capacity per 8 hr. shift (sawmill unit) _____

(b) Rated capacity per 8 hr. shift (planning mill unit) _____

(c) Horsepower of power source _____

(d) Description of power source _____

1.8 Operating Shifts

(a) Normal number of shifts per week _____

(b) Number of weeks in operation during the year _____

1.9 Average lumber recovery rate _____ fbm. lumber per m^3 log input.

Comments: _____

_____

_____

Section II Employment

2.0 NUMBER OF EMPLOYEES (WAGE EMPLOYEES AND SALARIED EMPLOYEES) BY MONTH (INCLUDING CONTRACTOR EMPLOYEES).

	Location	
Month	Woodlands	Mills and Office and Sales
January		
February		
March		
April		
May		
June		
July		
August		
September		
October		
November		
December		

Identify contractor/own employees under "location"

2.1 Employment Summary:

(a) Own employees _____ Man-months

_____ Man-years (Man months/12)

(b) Contractor(s) employees (estimate)_____ Man-months

_____ Man-years

2.2 % of Employees of Native Origin

(a)Woodlands _____%

(b)Mill/Office _____%

2.3 List of communities employees most directly associated with (i.e. either reside directly within or do the majority of their business within).

	Community	% of Employees
1.		
2.		
3.		
4.		

Section III Wood Inputs

3.0 SPECIES COMPOSITION OF ROUNDWOOD INPUTS (INCLUDING PURCHASED).

White spruce _____%

Black spruce _____%

Jack pine/Lodgepole _____%

Balsam fir _____%

Popular/Aspen _____%

Birch _____%

Other conifer _____%

Other deciduous _____%

Detailed Wood Input Breakdown	Quantity	Specify Units	Crown	Private	Imported	Cutting Cost	Skidding Cost	Hauling Cost	Total Cost at Mill Gate	Average Haul Distance (km)
Own cut										
Own cut										
Contract Cut										
Contract Cut										
Contract Cut										
Purchased Wood Specify: _____										
Purchased Wood Specify: _____										
Purchased Wood Specify: _____										
Total:						*	*	*	*	*

Put into 3.2
* Weighted average

Section IV Production & Capacity

4.0 CUSTOM PRODUCTION

(a) If your firm custom sawed roundwood for others, describe giving quantity produced and average rate charged.

Quantity: _____
Rate: _____

(b) If your firm custom planed lumber for others, describe giving quantity produced and average rate charged.

Quantity: _____
Rate: _____

For Use by All Sawmills, Planer Mills, Sawmill/Planer Complexes

Detail Product Description (including chips)
(Based on total sales incl. custom work)

Total Production _____ fbm
Total Sales _____ fmb
(if different)

	Quantity		Average value per unit by group ($ per-mit) fob mill gate	Total sales by group ($)	Geographical Destination by % (for major group)	Transportation Mode by % (for major group)	% Delivered to Market Kiln Dried
	softwood	hardwood					
Dimension:							
% dressed ___							
% rough ___							
2 X 2							
2 X 4							
2 X 6							
2 X 8							
2 X 10							
2 X 12							
Boards:							
% dressed ___							
% rough ___							
1 X 2							
1 X 4							
1 X 6							
1 X 8							
1 X 10							
1 X 12							

4.2

For Use by All Sawmills, Planer Mills, Sawmill/Planer Complexes

Detail Product Description

	Quantity		Average Value Per Unit by Group	Total Sales by Group	Geographical Destination by % (for major group)	Transportation Mode by % (for major group)	% Delivered to Market Kiln Dried
	Softwood	Hardwood					
Timbers:							
% dressed __							
% rough __							
size:							
Railway Ties:							
Plywood:							
Fence Posts:							
Poles:							
Chips:							
Other:							

5.0 MARKETS

- Own use

- Yukon:
  - local (within 50 miles)
  - other Yukon communities

- NWT
  - Inuvik
  - Other NWT centres

- Alberta

- B.C.

- Other provinces

- Alaska

- Pacific Rim

- Other
  Specify: _____

5.1 Lumber grade by %: _____ _____

_____

_____

_____

5.2 Special Services: _____

_____

_____

_____

6.0 ENERGY CONSUMPTION

	Quantity Used	Unit	Cost at this Establishment
Motor gasoline			
Diesel - woodlands - mill - Total			
Fuel oil			
Liguefied Petroluem Gas			
Electricity			
Hog fuel			
Other (specify)			

7.0 REAL ESTATE VALUES

(a) What is the current property value of mill site land?

_____

(b) What is the replacement value of buildings and structures?

_____

8.0 WOOD RESIDUE PRODUCTION (NOT INCLUDING CHIPS).

	Quantity Produced	Quantity sold or utilized	Value of material utilized/sold
Slabs/edgings/trim			
Sawdust			
Wood shavings			
Bark			

9.0 PRODUCTION COSTS

Please check the appropriate space. If higher or lower please specify range. Most costs (except wood) in $ per Mfbm produced.

9.1 Wood Costs

Laid down costs of round wood per cord at the mill before chip credits. ($ per cord).

_____	☐	☐	☐	☐	☐	☐
Lower	60-65	65-70	70-75	75-80	80-85	85-90

☐	☐	☐	☐	_____
90-95	95-100	100-105	105-110	Higher

9.2 Production Labour

All hourly paid production labour (equipment operators, graders, labourers, etc.) including maintenance labour and all fringe benefits ($ per Mfbm).

_____	☐	☐	☐	☐	☐	☐	☐	☐	_____
Lower	30-33	33-36	36-39	39-42	42-45	45-48	48-51	51-54	Higher

9.3 Maintenance and Operating Supplies

These supplies include lubricants for all machines (including moveable equipment), replacement parts (sawmill knives, blades, etc.), other clean-up and maintenance supplies ($ per Mfbm).

_____	☐	☐	☐	☐	☐	☐	_____
Lower	4-6	6-8	8-10	10-12	12-14	14-16	Higher

9.4 Administrative Expenses

Salaried office staff includes all salaried personnel (management, engineers, accountants, clerks, etc.) except salesmen ($ per Mfbm).

_____	☐	☐	☐	☐	☐	☐	☐	☐	_____
Lower	14-16	16-18	18-20	20-22	22-24	24-26	26-28	29-30	Higher

Sales Expenses includes all expenses directly incurred in selling the product (salesmen, promotion, etc.) ($ per Mfbm).

_____	☐	☐	☐	☐	☐	☐	_____
Lower	1-2	2-3	3-4	4-5	5-6	6-7	Higher

9.5 Interest Charge

Interest charges paid ($ Mfbm).

____	☐	☐	☐	☐	☐	☐	____
Lower	2-3	3-4	4-5	5-6	6-7	7-8	Higher

9.6 Transportation Costs to Market

Cost of shipping in Canadian Dollars ($ per Mfbm)

____	☐	☐	☐	☐	☐	☐	☐	☐	____
Lower	30-33	33-36	36-39	39-42	42-45	45-48	48-51	51-54	Higher

10.0 CAPITAL COSTS

The study group is attempting to determine the capital costs of existing capacity of sawmills. These capital costs include costs of plant and equipment. Please fill in the information below.

A. Buildings - including foundation, buildings and all services.

	Type	Square Footage	Cost	Date
Example	Sawmill	20,000	$500,000	1975

B. Equipment

B1. Yard Equipment - including lumber-handling, log-hauling, yard maintenance equipment etc. (Estimate if lease or rental.)

	Type-Model or Mfg.	Number	Individual Cost	Model Year or Approximate Age
Example	Fork lifts	3	$100,000	1977

B.2 Sawmill Equipment - including log sorter, saw lines, chippers, edgers, stackers, conveyors, dry kilns, planers, trimmers, chip blowers, etc.

	Type-Model or Mfg.	Number	Individual Installed Cost	Model Year or Approximate Age
Example	Chip 'n Saw - Mark II	3	$100,000	1977

11.0 COMMENTS

Please make any comments you feel might be helpful to this study.

THANK YOU